CHAPTER NINETEEN CONCENTRATION-DEPTH SERIES

19.1 INTRODUCTION

19.1.1. General

Using this application you may create a data base with various chemical constituents related to the depth of sampling. This is especially important in cases when the sampling is repeated over the drilled hole depth, and samples are taken from soil and water as the drilling progresses. Likewise, in saline water environments such as in coastal aquifers, the salinity stratification is often the case.

The data base is in a form of individual tables, one for a well, plus some general information that may also be a part of the data base. The display is user-designable. You decide whether you wish to display one or more constituents on the same diagram, whether you wish to use bar or line graphs, and whether the scale will be linear or logarithmic. You may display one or more constituents as linear graphs, and another as logarithmic. That is, each constituent may be assigned its own attributes for presentation.

As in other parts of GWW, you may create graphs and save them for later printing.

This application is a part of the Chemistry application. It branches off from Chemistry as shown in Figure 19-1. To activate it, you should select Applications, then Chemistry, and then Concentration-Depth.

19.1.2. Application's Content

As shown in Figure 19-2, the Concentration-Depth application is comprised of the following major options:

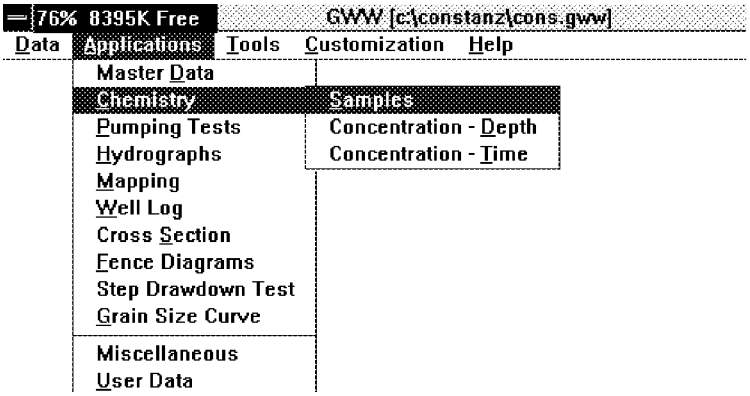


Figure 19-1

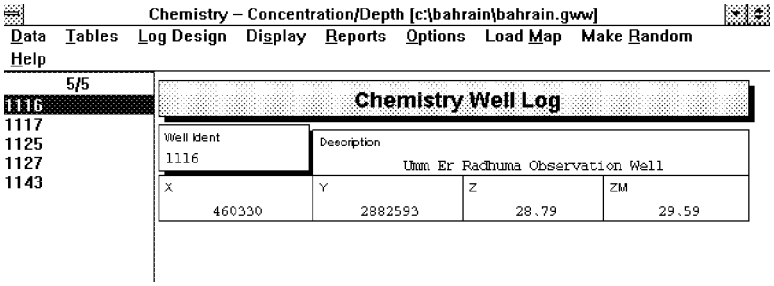


Figure 19-2

- Data
- Tables
- Log Design
- Display
- Reports
- Options
- Map
- Make Random
- Help

Prior to using this application you must modify the file structure for "concentration - depth series" to make it

compatible with the parameters that you wish to store, display, and retrieve as reports.

From the Main menu on GWW, you should select Tools, followed by Data Structure Design. This activates the file structure editor. Select Files, followed by Old. From the list of internal data structures select the one labeled Chem_Conc_Depth_Tab. In the default template, GWW.000, which comes on the distribution diskette, the only entry that is prepared is Depth. Using the editor create your own list of chemical constituents that you wish to store in the data base. One of such lists is shown below.

Depth	10	Num(Dim)	Fixed 2	m
Cl	10	Num(Und)	Fixed 2	
Na	10	Num(Und)	Fixed 2	
TDS	10	Num(Und)	Fixed 1	
Conductivity	10	Num(Und)	Float 1	

As it is prepared, one may store, display and report data on chloride, sodium, total dissolved solids, and on conductivity of water.

The Data menu is shown in Figure 19-3. In this menu you

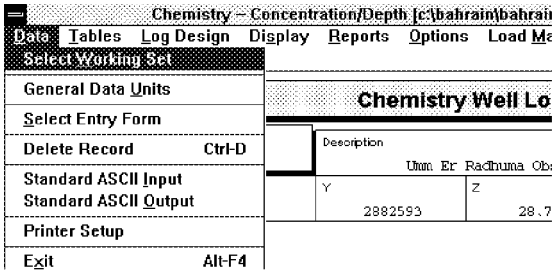


Figure 19-3

select your current working set (reduce a large set to a smaller, thematic set). You may check which units are

currently used for general data (sampled well coordinates and elevations). You may select one of entry forms that you may have eventually created. You may also delete a record. You may read general data on sampled wells (coordinates, elevations, descriptions, names, etc.) from an ASCII file, or you may save such data to an ASCII file. This menu deals with wells and not with tables. A table is the place in which you type chemical constituents as a function of depth. This latter is done using the menu Tables.

The Tables menu is shown in Figure 19-4. Using this menu you either type your data, edit table, add or re-

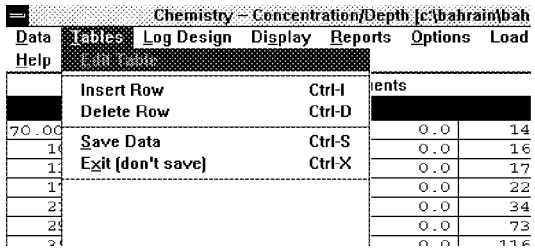


Figure 19-4

move some rows in the table, save data, exit (close) table, and check or modify units used for depth. Just the same as in other applications, you may save your tables (depth-concentration data) and/or import them as ASCII files.

The Log Design menu is shown in Figure 19-5. The com-

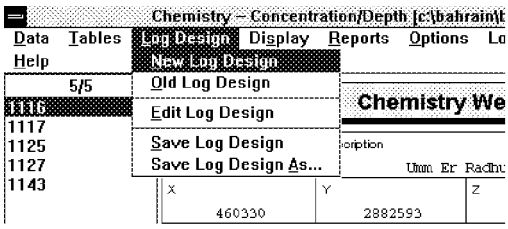


Figure 19-5

mands on this menu are used to customize the display and printout. The customization means, first, which constituents from a table you wish to display. For example, although you may have entered the values for Na, Cl, TDS, and conductivity, you may decide to display and/or report only total dissolved solids. Second, you may assign some attributes to the constituents to be displayed: line and fill color, linear or logarithmic display, bar or line type of graph, minimum and maximum concentrations to display, etc. You may also select the vertical scale for the graph, and control widths of individual columns used to display constituents. Finally, you may control the fonts used to label the graph. On this menu you design a "display" log, you edit it, save it, or select one of available designs.

The command Display does not have any other subcommands. It does what it says. It displays a graph with data from table connected to a currently highlighted sample, using the design for the graph as currently selected.

The Reports menu is shown in Figure 19-6. Using the commands on this menu, you may print a graph, or save it for future printing, or mixing with other graphs.

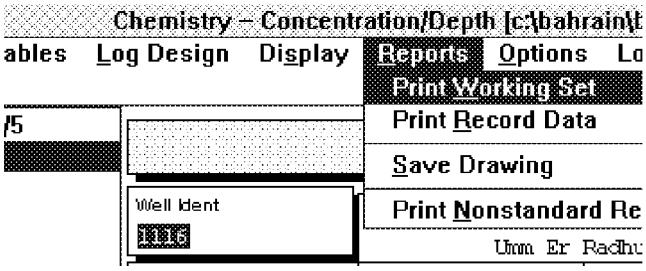


Figure 19-6

The Options menu allows you to switch between parts per million (PPM) and equivalents per million (EPM). Of course, this will apply only to charged ionic constituents for which conversion factors are available in the auxiliary file PPMTOEPM.TBL.

The Map menu is explained in Chapter 5, Section 5.3.2. It is used to load a map and select sampled points directly from the map.

The Make Random menu is also explained in details in Chapter 5, Section 5.6. It will be used for creating location or site maps showing sampling points at which depth-variable chemical data are available.

19.2. DATA MENU

The routines on this menu are equivalent to similar routines in other applications. For example, see Pumping Test, Hydrographs, Step-Drawdown, or Grain-Size application.

19.3. TABLES MENU

Using the commands on this menu you are creating your data base as it refers to concentration of selected constituents with depth. You may import an already created table as an ASCII file, one for a sample, or you may use the GWW editor.

19.3.1. Edit Table

When you select the Edit Table command for a new sample, the editor displays an empty table listing all constituents that you have listed in the Data Structure on the Tools menu. In the case of only four constituents selected (Na, Cl, TDS, and Conductivity), the table may look as shown in Figure 19-7. If you are going to edit an existing table filled with data, the display may look as shown in Figure 19-8.

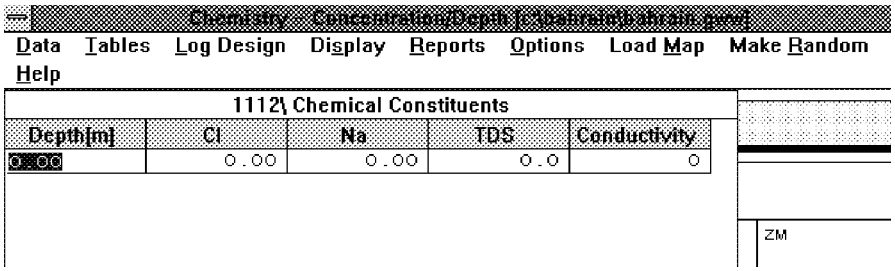


Figure 19-7

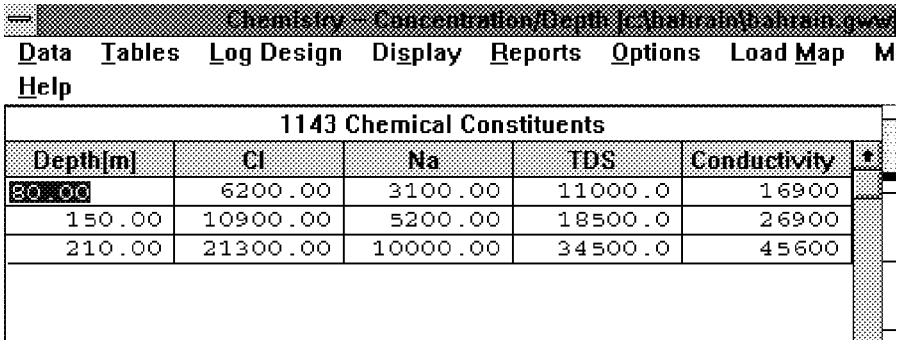


Figure 19-8

To edit data, you use standard GWW commands: TAB to move from one field to the next, Shift+TAB to move backwards, CTRL+I to insert a line, CTRL+D to delete a line. The program does not check the sequence of depth entries. You are expected to use the logical sequence, from shallow to deeper.

19.3.2. Save Data

When you finish typing the data you will save them using one of the two ways. The first is to press the Ctrl key and simultaneously press the S key. The other way is to use the mouse and click on Tables on the menu bar and click again on Save Data.

19.3.3. Exit without saving

You may decide only to view the data without saving them. Again, you have two ways to do it. The first is to press the Ctrl key and simultaneously press the X key.

The other way is to use the mouse and click on Tables on the menu bar and click again on **Exit (Don't save)**.

19.3.4. Standard ASCII Input and Output

The data tables can be created outside the GWW package using a text processor. The format is similar to the format in other applications. One such table is reproduced below.

<Depth>	<Cl>	<Na>	<TDS>	<Conductivity>
190.00	12200	6300	22600	29800
240.00	24300	12500	40000	51200
290.00	39300	20000	64500	73500

The first line is the header line which tells GWW what are the numbers that follow. As in any other part of GWW, you must be consistent in declaring the field names (Depth, Cl, etc.). These must be typed exactly the same as they are typed in Data Structure (in Chem_Conc_Depth_Tab).

NOTE. The "depth" entry is protected. You cannot change the word or the way it is typed. GWW expects the word Depth which it uses internally.

Using the command **Standard ASCII Input** you can import data tables created with a text processor or a spreadsheet program. (If you use spreadsheets, you must print such tables to a file. Spreadsheet program creates normally ASCII files, which then can be directly imported into GWW.)

Using the command **Standard ASCII Output** you are saving the data tables in ASCII format, such as the one shown above.

19.3.5. Depth Units

The units for depth are normally specified in Data Structure, in internal file *Chem_Conc_Depth_Tab*. However, you may change the units from within the application, using the command **Depth Units**.

19.4. LOG DESIGN MENU

On this menu you have five options:

- New Log Design
- Old Log Design
- Edit Log Design
- Save Log Design
- Save Log Design As

After you have created data table you will want to display graphs showing how concentration of one or more constituents changes with depth. Before you can display a graph, you need to create, modify or edit the design of such presentation. In GWW terminology, we use Log Design, implying that this is a vertical presentation of chemistry with depth.

19.4.1. New Log Design

When you select **New Log Design** GWW opens a dialogue box as shown in Figure 19-9. Some of components in this dialogue apply to the general layout of the display, such as Heading height and column axis height, fonts to be used on the graph, units for depth and level, and scale of the graph. The right side of the dialogue lists all available constituents (taken from Data Structure or from the internal file Chem_Conc_Depth_Tab). You may select one or more constituents to display, and by clicking on the button Attributes control how each constituent will be presented.

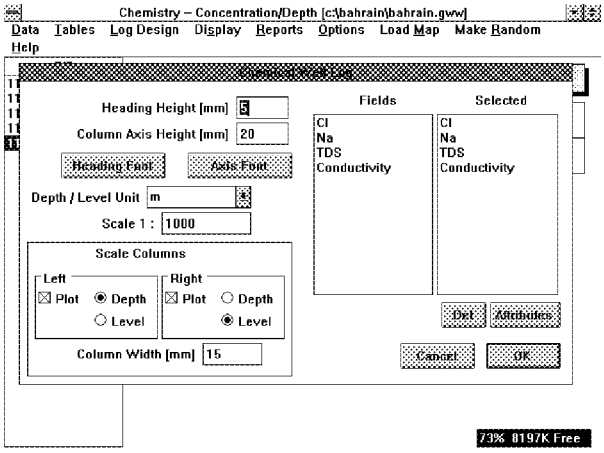


Figure 19-9

You are selecting or unselecting a constituent by highlighting it. If you highlight a constituent on the left side, that is within "Fields" part of the box, such constituent will be moved to the "Selected" side. If you highlight a constituent on the "Selected" side and press the button Del, this constituent will be deselected and will disappear from the list of selected constituents.

Below is explanation for each of options in this dialogue box.

Del ... Removes a constituent from the "Selected" field. Highlight the constituent you do not wish to display and press Del.

Heading Height ... Using this option you may change the height of the header row, with names of constituents, and words Depth and Label. The values are in millimeters.

Column Axis Height ... Using this option you select the size of the row in which individual concentration values are displayed.

Heading Font ... You may select fonts (family and size) for the header row.

Axis Font ... You may also control the font you are going to use for displaying individual values of constituents.

Depth/Level Unit ... Although the unit is preselected by you in Data Structure (the unit for depth), you may override your selection using this option.

Scale ... Depending on the depth you are going to present and the paper you will use to print the graph, you may change the scale.

Column Width ... The width you type here refers to the width of vertical columns in which Depth and Level values are displayed. The default is 15 mm.

Plot ... The graph is designed to plot either Depth or Level axes on the left and the right. You may control whether you wish to plot one, both, or none (?) ordinate axes, and where you will place the depth or level axis, to the left or to the right side of the graph.

19.4.2. Attributes

When you select a constituent or a chemical diagram parameter, you may control the way in which this particular constituent or parameter will be displayed. You will use the button **Attributes**. The dialogue box as shown in Figure 19-10 will be opened.

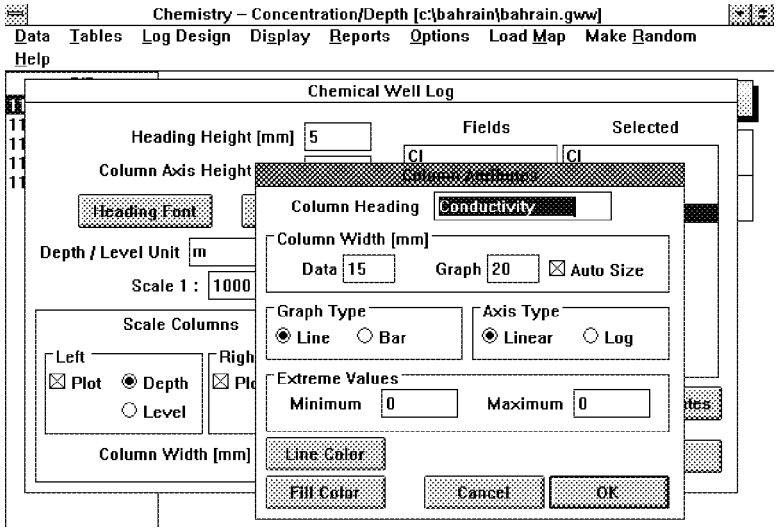


Figure 19-10

The entry "Column Heading" will offer the name of the constituent as found in the internal file Chem_Conc_Depth_Tab. However, you may override this offer and type a different name (e.g. in another language).

The options for column and graph width allow you to increase or reduce the size of vertical columns in which data (concentrations of a constituent) and graph (its graphical presentation) are displayed. While you may select the width for data, you are advised to keep the box **Auto Size** checked. GWW will then automatically select the size for the column in which the graph is displayed.

The **Graph Type** option allows you to select either line or bar graph. The **Axis Type** option allows you to display data as linear or logarithmic series. The **Extreme Values** (minimum and maximum) option lets you select the range of concentration you wish to display.

For each constituent you may select color for lines and for fills.

19.4.3. Old Log Design

Since you may create one or more designs for displaying various constituents and save them by assigning names, you may also retrieve and use one of pre-created designs. When you select the option **Old Log Design**, the list of all available designs will be listed, as shown in Figure 19-11.

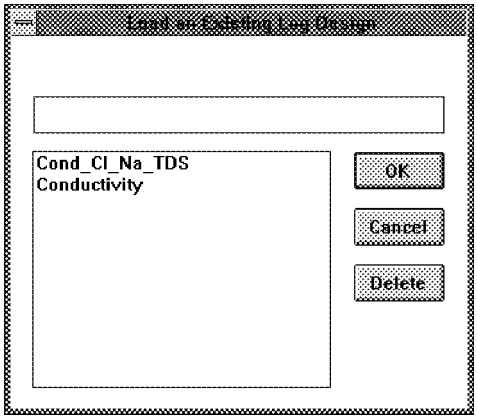


Figure 19-11

19.4.4. Save Log Design and Save Log Design As

When you finish editing an existing log design, you may save it under the name it was opened. GWW will not prompt you for a name. It will assume you want to use the old name.

You may save a design under a different name. For this you will use the option **Save Log Design As**.

19.4.5. Edit Log Design

The same dialogue box as the one shown in Figure 19-9 will be displayed and you may proceed with its editing in the same way in which you have created a new design.

19.5. DISPLAY

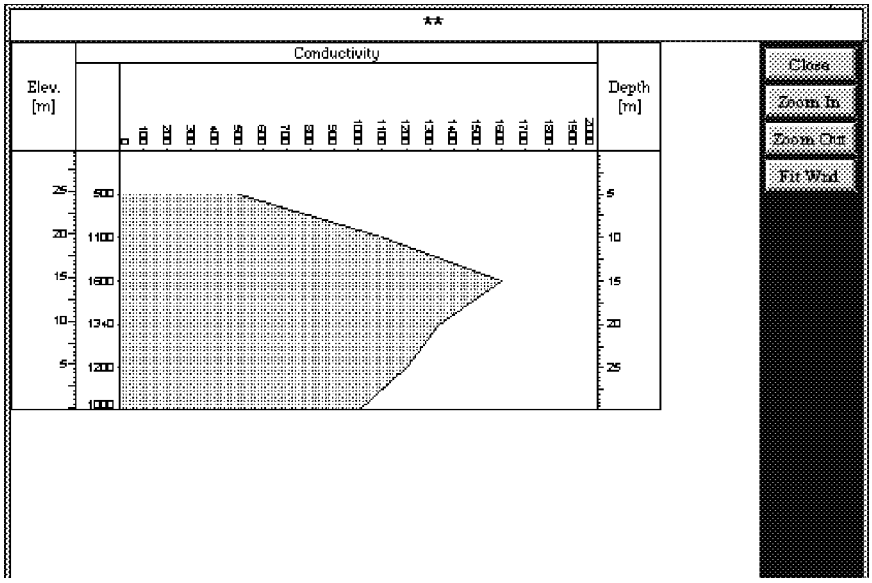
Figure 19-12 displays a graph with conductivity as the only parameter selected. Figure 19-13 displays a graph with four different constituents and/or parameters.

19.6. REPORTS

You may print a depth-concentration graph using the option Report from the application's menu bar. As shown in Figure 19-14 you will have to select between two reporting options:

- Print Graph
- Print Table

The option **Print Graph** will print the graph of the sample currently selected. The option **Print Table** will print information, in a tabular form, for all wells/samples that comprise the current working set. The information which will be printed will depend on what you have declared in the report form. When you select to print using one of options in the upper two lines of the menu, the program will prompt you to select a reporting form.


**
Conductivity
Elev. [m]
Depth [m]
Close
Zoom In
Zoom Out
Fit Wnd

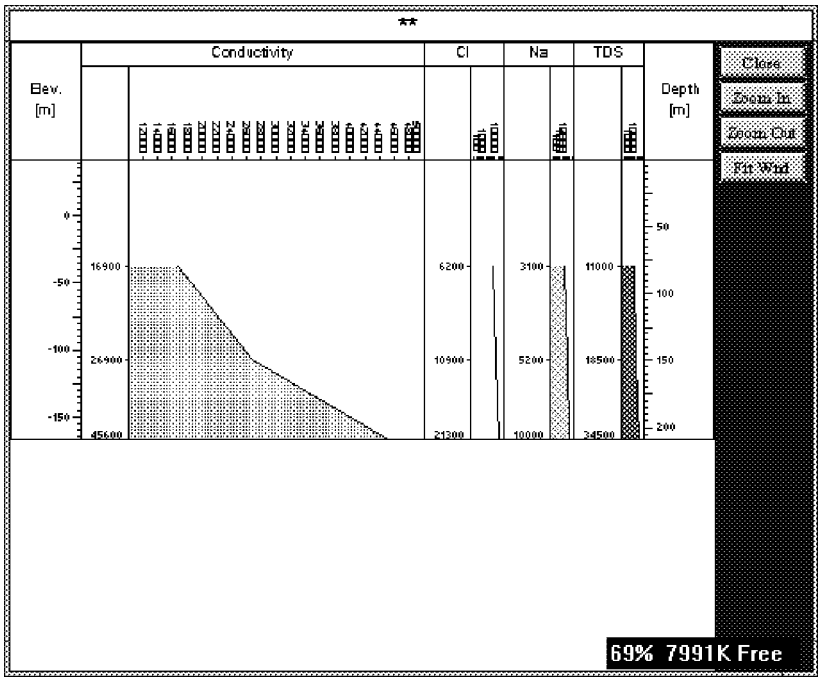

**
Conductivity
Cl
Na
TDS
Elev. [m]
Depth [m]
Close
Zoom In
Zoom Out
Fit Wnd
69% 7991K Free

Figure 19-13

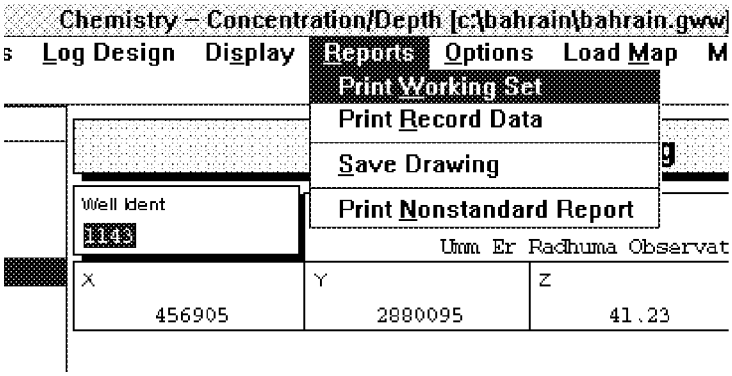


Figure 19-14

You may also save a depth-concentration graph for placing it on a nonstandard reporting form, eventually mixed with other graphics. For this, you use **Save Drawing** option, followed by **Print Nonstandard Report** from this or another application.

19.7. OPTIONS

Using this command, you may switch between parts per million (PPM) and equivalents per million (EPM). This is important in two instances. The first is the way in which constituents will be displayed. If you select EPM, the values displayed will be converted to equivalents per million, and vice versa. This option is also important to correctly import data tables as ASCII files. Depending on whether the data are prepared as ppm or epm, you need, prior to importing ASCII files, select the compatible mode of input. So, if your data have been prepared as ppm, you may use the default which is ppm. However, if the data have been prepared as epm, you should follow the sequence:

1. Select Options and select Show EPM values.

2. Select Table and select Standard ASCII Input.

19.8. MAP

The **Load Map** option is a general option for selecting wells to make a **Working Set** of wells.

19.8.1. Select Working Set from Map

The sequence is normally:

1. Click on **Data** to open the menu.
2. Click on **Select Working Set** and Unselect all wells. This is important because any selection adds new wells to the existing working set.
3. Click on **Map** to open the menu. Wait for the dialogue box to list available maps.
4. Select one of maps listed.
5. Select wells to make a working set using either Rectangle, Points, or Area. In the case of Points, use other buttons on the right side to complete the selection (End Points). In the case of an Area, after you circle an area (remember, in clockwise direction you are selecting within the area; in the counterclockwise direction outside the area!) you should close the area (End Point) followed by End Digitizing button. The wells (samples) will be listed in the left-side identification window.

19.9. To Setup a Printer

Selection of printers and attributes related to printing is normally a Windows operation. You may set up your printer parameters from Windows, prior to running the GWW program. To do this:

1. From **Main Group** select **Control Panel**.
2. Select **Printers**.
3. Select one of installed printers as a default printer, or add some more printers to match your hardware.

4. Select **Setup** and modify whatever you want to modify.

5. Click on **Set as default**.

6. Close **Printers** and **Control Panel.**

You may do about the same from inside the GWW. From within the GWW you use Printer Setup to change the orientation of printout, portrait (vertical) or landscape (horizontal), the printing medium, the quality of print, number of copies, colors for a color printer, and many more. You cannot change the default printer!

The dialogue box for selecting printer parameters is shown in Figure 19-15 for Hewlett Packard Laserjet 4/4M printer.

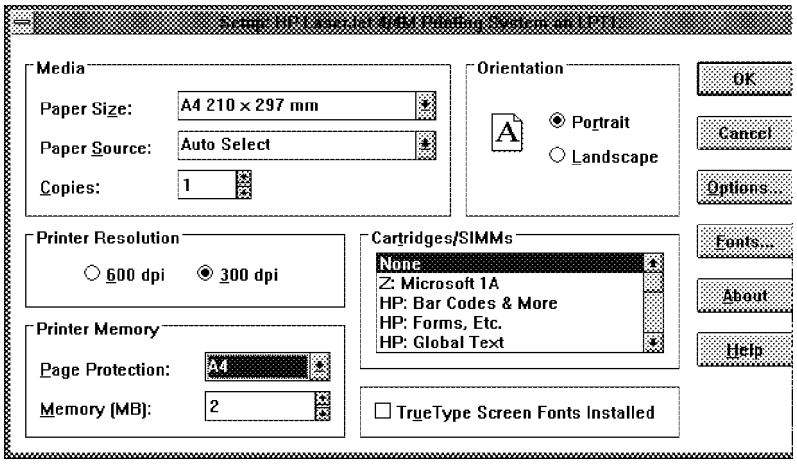


Figure 19-15

EXAMPLE

In the following example you will create data structure, use the default entry form supplied by GWW, and enter data with the following depth-dependent constituents: toluene, phenol, and benzene.

The data to input are the following:

Depth	Toluene	Phenol	Benzene
5	0	0	0
10	50	25	125
15	100	65	120
20	1000	75	70
25	155	25	0
30	0	0	0

Since the range of toluene is from 0 to 1000, you may select to display toluene in logarithmic scale, and the other two linearly.

1. To start with, from the GWW Main menu you will click on **Tools**, followed by **Data Structure Design**.
2. Wait until the new menu bar is displayed. Select **File**, then **Old**. Locate the internal file titled Chem_Conc_Depth_Tab.
3. Notice that there is only one entry, Depth. If you are working in feet system, you may want to replace the default unit for length, which is meter for foot.

4. Select **New**. Type Toluene. Use TAB to move to next field. Accept the default width of the field as 10 characters. Move down the dialogue box and check Numeric (do not check on Numeric dimensioned since the concentration of a chemical is a nondimensioned

number!). Click on OK. In the next dialogue box select OK accepting all defaults (2 decimal digits, fixed point arithmetics). Notice that Toluene is displayed in the list of constituents.

5.Repeat the same for Phenol.

6.Repeat the same for Benzene. The list should now contain 4 parameters as shown in Figure 19-16.

7.Close the dialogue box by selecting OK, select **File** and **Exit**. The new data structure for depth-concentration is created.

8.Click on **Applications** on the GWW Main menu, then

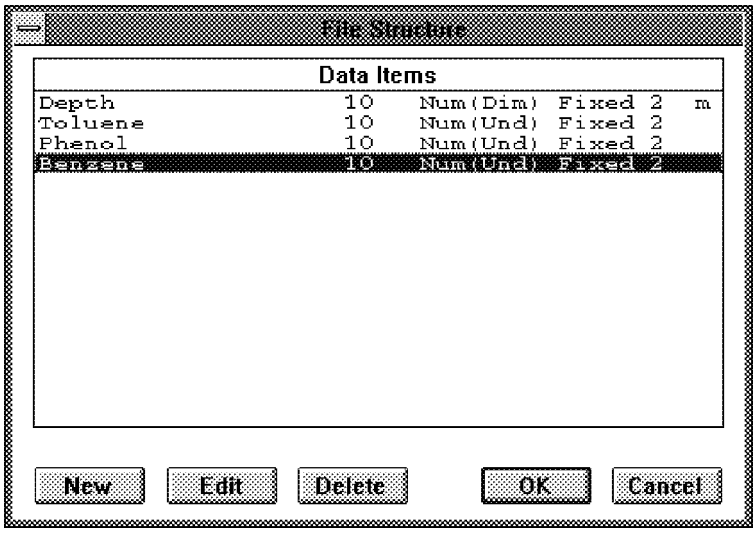


Figure 19-16

on **Chemistry**, and then on **Concentration - Depth**.

9.GWW will display an entry form which will have only one field, Well Identification. The cursor will be in this field.

10.Type the well number, say MW-1. Now finish the input by pressing Page Down key once to complete the entry, and second time to highlight this well and

make it active. Alternatively select this well using the mouse.

11.Select Tables and click on Edit table. The display will be as shown in Figure 19-17. There will be four columns (Depth, Toluene, Phenol, Benzene), each with a 0.00 value. Fill in the values as prepared for this example. The table will look as shown in Figure 19-18.

MW-1 Chemical Constituents

Depth[m]	Toluene	Phenol	Benzene
0.00	0.00	0.00	0.00

Figure 19-17

12.When you finish typing, leave the cursor in the last typed row, that is depth 30, in the fourth column, and press the combination Ctrl S. (Alternatively, you may

MW-1 Chemical Constituents

Depth[m]	Toluene	Phenol	Benzene
5.00	0.00	0.00	0.00
10.00	50.00	25.00	125.00
15.00	100.00	65.00	120.00
20.00	1000.00	75.00	70.00
25.00	155.00	25.00	0.00
30.00	0.00	0.00	0.00

Figure 19-18

click on Tables, and then on Save.)

13.Now you will create your own log design. Select Log Design on the menu bar. Select New Log Design. The screen will display the three constituents as "selected fields", as shown in Figure 19-19.

14.Change the scale from the default 1000 to 500. Click on OK.

15.Now you may see immediately the graph. Click on Display. The default parameters are used to display this graph. The display is as shown in Figure 19-20. Click on the button Close to remove this graph.

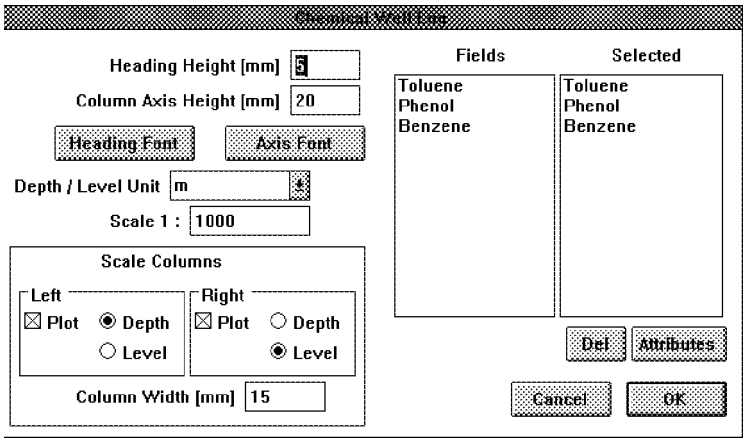


Figure 19-19

16.Modify the graph design. Select **Log Design**, then **Edit Log Design**. Click on Toluene on the right side

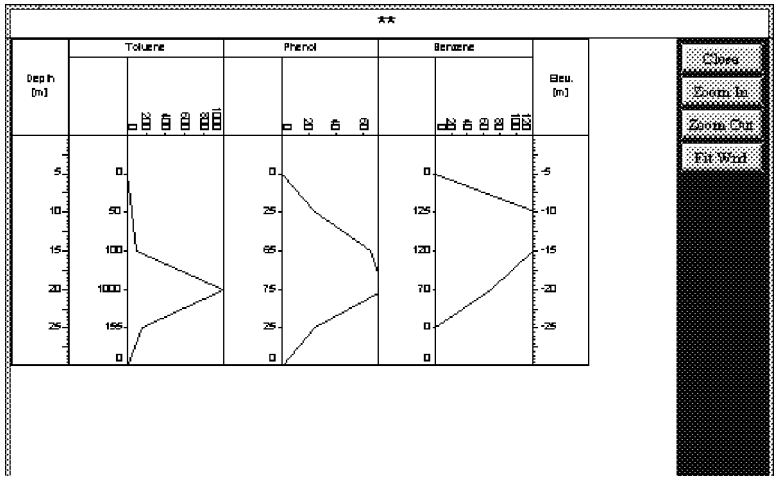


Figure 19-20

of the dialogue box. The constituent Toluene will be

highlighted. Now click on the button Attributes. In the new dialogue box check the field Logarithmic, and in the boxes Minimum and Maximum type 0.1 and 1000, respectively. Click also on Fill color and select a color. Click on OK to close the Attributes dialogue. Now replace the word Toluene in Column Heading box with TOLUENE ppb. Click also on Heading Font, and select for font Arial 12 points, bold. Click on OK to close the font dialogue box, and then OK to close the log design editing box.

17. Select **Display** again. The screen looks as shown in Figure 19-21. Save this log design. Close the display. Select **Log design**, followed by **Save Log Design**. Type a name for this design.

18. The task now is to have only toluene displayed

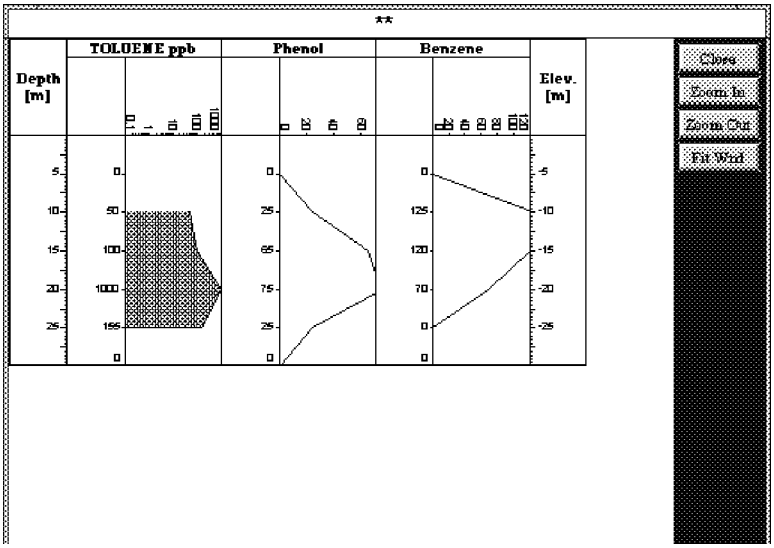


Figure 19-21

and/or printed. Select **Log Design**, then **Edit Log Design**. Highlight phenol and click on **Del**. Repeat the same with benzene. Only toluene remains in the "selected" list. Highlight Toluene and click on Attributes. Notice that the width of the graph field is still 25 mm. Click on OK and then repeat highlighting Toluene and selecting Attributes. Notice now that the

width of graph is 105 mm. This is automatically calculated, since there will be only one graphic field. Click on **OK** and select **Display**. The display is as shown in Figure 19-22.

19. Close the display, exit the application, and exit GWW.

This ends this example.

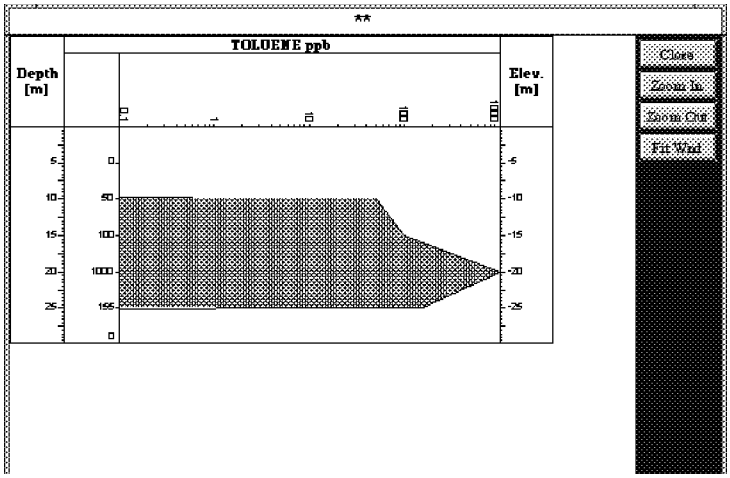


Figure 19-22

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