ENVR 640/FALL1996 Assignment Due: 24 Oct 96
Homework #1

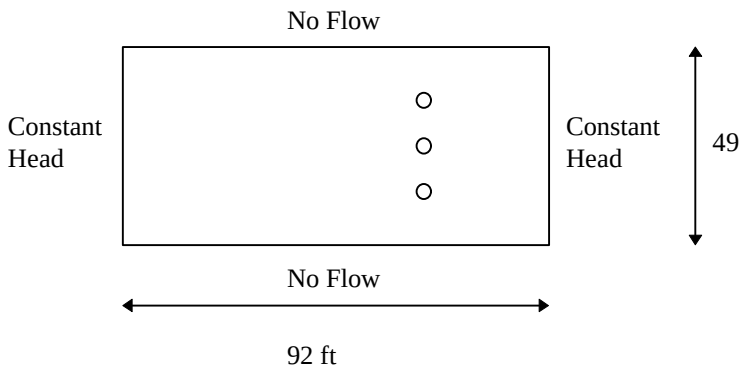
OBJECTIVES:
1) Practice analyzing flow lines
2) Gain appreciation for numerical flow models

ASSIGNMENT:
1) Determine the minimum flow rate necessary to capture all flow lines between pumping wells for 2-D pumping problem.
2) Determine if boundary condition assumptions have been violated.

SCENARIO:

1) 2-D flow field, 92 ft x 49 ft
2) Homogeneous, isotropic, confined aquifer
3) Constant head boundaries on Y-axis (x = 0 and x = 92 ft)
4) No-flow boundaries on X-axis (y = 0 and y = 49)
5) 3 pumping wells located at the following coordinates:

x = 51 ft y = 10.4 ft
x = 51 ft y = 24.5 ft
x = 51 ft y = 38.6 ft



Hydraulic Conductivity: 2.35(10-4) ft/s
Aquifer Thickness: 65.6 ft
Boundary Conditions:
These represent regional aquifer behavior and not physical barriers or surface waters:

h = 1.575 ft @ x = 0 ft
h = 0 ft @ x = 92 ft

APPROACH:
1) <u>To run XFLOW on your own computer</u>: Copy the XFLOW numerical groundwater model loaded under K:\ENVR640. Copy the entire XFLOW directory to a floppy disk and transfer to a hard drive first before running XFLOW. Make sure you rename the files with the original file extensions. Because the K: dirve is a UNIX platform, the *.site, *.chem, and *.trans extensions are shortened. These need to be restored for XFLOW to work properly. The correct directory structure for XFLOW is also required for the program to execute. The XFLOW directory must be loaded under the root directory (e.g. C:\XFLOW). Further details are contained in the “readme.doc” file. XFLOW will not run from the K: drive or from a floppy drive. XFLOW requires Windows 95 and recommends a Pentium processor with 12 MB RAM although a lesser system will probably work too.

2) To run XFLOW on the ENV computer: Copy the input file, hw1.xfl, to a new filename ____.xfl. You will also need to copy and rename the hw1.trans, hw1.chem and hw1.site files to the same prefix name. Restore the original file extensions. Run simulations from you own input file.
3) Run the executable file "XFLOW.EXE". Select OPEN under the FILE menu on the opening screen and open "hw1.xfw". Click "OK" on the warning for the default values. This file is already set up with the proper flow field dimensions, hydraulic conductivity, and boundary conditions. Wells are already placed at the given coordinates but are inactive.
4) Under the PLOT menu, select HEAD.
5) Under OPTIONS select SIMULATION STATUS and drag the window to a convenient location on the screen. Move the mouse to points on the flow field and observe the respective X and Y coordinates reported on the status window. The Z coordinate is reported as the head at a specified location.
6) Turn wells on by clicking on the respective well and selecting PUMPING under the well type on the well information screen. Provide the flow rate for the well and select OK. XFLOW redraws the head contours.
7) Select STREAMLINES under the PLOT menu to determine the effect of the flow rates you selected for your wells on the capture zones. Click at points on the flow field to have XFLOW draw the streamlines in. Select ERASE STREAMLINES under the PLOT menu to have XFLOW remove old streamlines after flow rates have been changed.
8) When you have optimized the pumping scenario, WRITE DOWN YOUR RESULTS. Because this is a demo version of XFLOW, you cannot save the file or print results directly. However, you can perform a screen capture to save the image of the optimized flow field with head contour lines and streamlines using "print screen" on the keyboard. Paste this clipboard image into a WORD document and crop to a suitable size as in Fig 1:

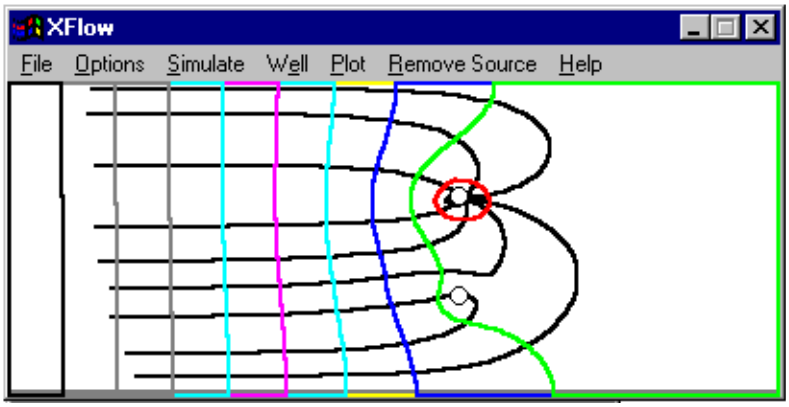


Fig 1: XFLOW Screen with streamlines and head contours

You can use the drawing tools in WORD to add text boxes next to the wells to identify well names, locations, pumping rates, and heads. Identify the wells and summarize the pumping information in a table.

WRITE UP: I am looking for ~ two-page typed discussion of your results and approach to the problem. Discuss how you arrived at the pumping rates and final optimized solution. Do you think the no-flow boundaries affect your solution? How did you assess this? I encourage you to use XFLOW, superpositioning, and/or other tools to further investigate head contours, flow lines, and boundry conditions. Be creative!

PRESENTATION: I will pick one person to present results on the assignment due date.