CE6361 Groundwater Hydrology , HW#4, Fall 1996 Due: 9/23/96

1) Piezometric heads are measured simultaneously in thirteen wells penetrating an isotropic confined aquifer of thickness B=50 meters, hydraulic conductivity K = 20 meters/day, and effective porosity of n=0.23.

Well	1	2	3	4	5	6	7	8	9	10	11	12	13
x	4.3	16.5	7.0	3.0	11.0	22.0	8.0	3.2	18.1	13.5	4.0	8.7	19.5
y	1.0	3.5	5.1	6.5	7.0	6.5	9.0	11.8	10.0	12.9	15.5	16.1	16.3
h	34.6	35.1	32.8	32.1	31.5	34.5	33.3	34.4	34.3	35.2	35.2	37.3	36.3

Each x,y coordinate unit = 200 meters

a) Draw a contour map of the head distribution (1 meter contour intervals) and the flowlines. (YOU MAY USE A SOFTWARE TOOL IF YOU WISH)

~~(b) Use inverse distance weighting to grid the data onto a 40 x 40 grid (with the lower left corner of the grid at (0,0)). Use the gridded data to draw a second contour map and compare the results to the map in part (a). What are the advantages to gridding data for mapping? What are the disadvantages?~~

b) Using the map, determine the specific discharge (direction and magnitude) at points A(10,4) and B(16,11).

c) Estimate the total flow through the aquifer between wells No. 10 and No. 9.

d) Estimate the time of travel for a pollutant introduced into the aquifer in the vicinity of well No. 12 to reach a pumping well near well No. 5.

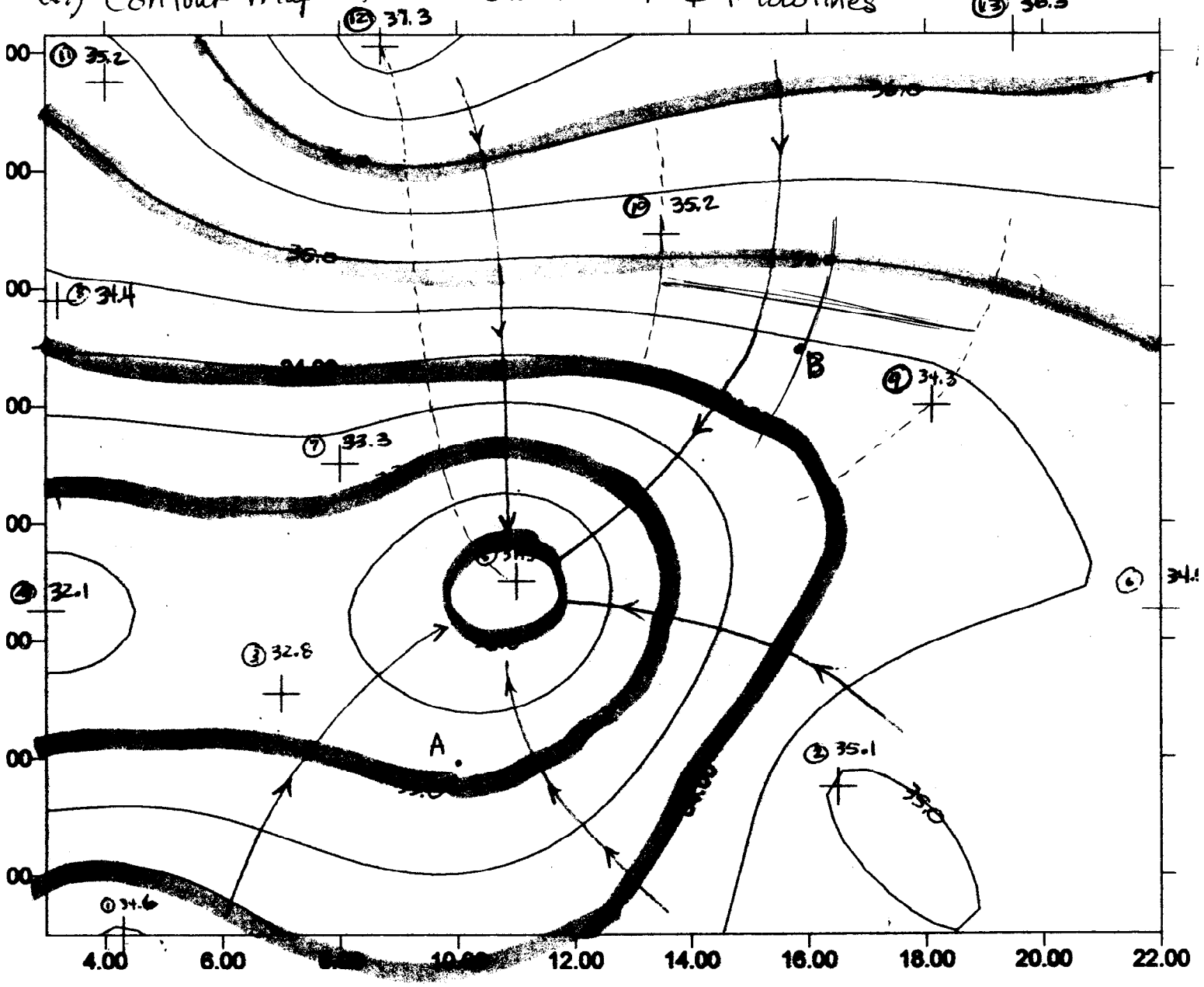
#1 Isotropic, confined aquifer

$B = 50m$

$K = 20 m/day$

$n = 0.23$

a.) Contour map of head distribution & Flowlines



(1 unit) = 200m = 1cm

b.) specific discharge @ A(10,4) & B(16,11)

$$q = k\frac{dh}{dL}$$

$$q_A = \frac{20m}{day}\left(\frac{1m}{530m}\right) = \boxed{0.038\ m/day = q_A}$$

$$q_B = \frac{20m}{day}\left(\frac{1m}{600m}\right) = \boxed{0.033\ m/day = q_B}$$

directions as shown on contour map

c.) Estimate total flow between wells #9 & #10

$$Q = kbw\frac{dh}{dl}$$

$k = \frac{20m}{day}$ $b = 50m$

~~$w = 1080m$ $dl = 280m$~~

$$Q = \left(\frac{20m}{day}\right)(50m)(1080m)\left(\frac{0.5m}{280m}\right)$$

$$\boxed{Q = 1900\ m^3/day}$$

d.) time of travel from well 12 to well 5

$$V = \frac{k}{n}\frac{dh}{dl} \qquad \frac{dh}{dl}_{Avg} = 0.003 \text{ over path}$$

$$V = \frac{20m/day}{0.23}(0.003) \qquad V = 0.26\ m/day$$

$L = ~~1900~~ 1950 m$

$$t = \frac{L}{V} = \frac{~~1900~~ 1950 m}{0.26m/day} = \boxed{7500\ days = 20.5\ yrs = t}$$