Hydraulic Head Across Aquifers

Friday, February 21, 2020 11:08 AM

A. Determine the hydraulic head in Well B

$Q = 20\ m^3/day$ $ds = 3300\ m$

$h_A = 50m$

$A = 20m \times 1000m = 20{,}000\ m^2$

Note: You have to use the scale bar in the legend to determin the width of the aquifer ($w = 1000m$). You will have to do the same to get ds ($\approx 3{,}300\ m$)

Now use Darcy's law

$$Q = -K \frac{dh}{ds} A$$

$$= -K \frac{h_B - h_A}{ds} A$$

$$h_B = -\frac{Q\,ds}{KA} + h_A$$

$$h_B = -\frac{(20\ m^3/d)(3{,}300\ m)}{(8640\ m)(20{,}000\ m^2)} + 50m$$

$\boxed{h_B = 50m}$

Note: K is so high in the gravel aquifer the water level does not change.

B. Determine the hydraulic head in Well C.

This is going to follow the same steps as part A. With wells B & C.

$$Q = -K \frac{dh}{ds} A$$

$$= -K \frac{h_C - h_B}{ds_{BC}} A$$

Where

$h_B = 49.96m$

$ds = 4{,}300\ m$

$A = 37m \times 1000m = 37{,}000\ m^2$

$$h_C = -\frac{Q\,ds}{KA} + h_B$$

$$h_C = -\frac{(20\ m^2/d)(4{,}300m)}{(86.4\ m/d)(37{,}000\ m^2)} + 50$$

$\boxed{h_C = 49.97\ m}$

C. Identify if the aquifer at Well C is confined or unconfined based on the water level in the well.

The water level in Well C is at an elevation of 49.97m, which is well above the bottom of the confining unit (shale layer). This aquifer would be considered as an artesian aquifer, as the water level (potentiometric surfaces) is above the land surface.