CE 4363/5363 Groundwater Hydrology February 23, 2022

Homework 5, Due March 2

1. Following a pumping test during which the pumping well was pumped at 1200 m^3/d for 12 hr, the pump was shut off and the residual drawdown, shown as s', in the observation well was measured. The recovery test data are shown in the table below. t' is the time since the pump was turned off. Find the transmissivity in m^2/d using the recovery test method.

t' (min)	s'(m)	t' (min)	s'(m)	t' (min)	s'(m)	t' (min)	s'(m)	t' (min)	s'(m)
1	2.94	10	2.21	50	1.31	180	0.86	480	0.48
2	2.80	15	2.04	60	1.22	240	0.73	600	0.41
3	2.68	20	1.90	80	1.07	300	0.64		
5	2.51	30	1.65	100	1.03	360	0.57		
7	2.38	40	1.55	120	0.90	420	0.52		

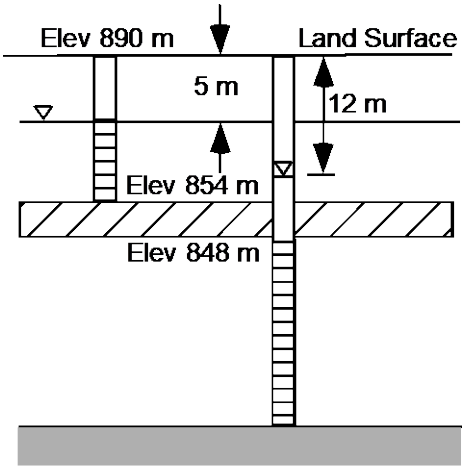
2. A slug test was performed in a shallow 2-in diameter monitoring well in Lubbock, TX. The borehole radius was taken as 2.5 in, and the initial depth of water in the well (water level to bottom of well) was 14.32 ft. The saturated thickness of the unconfined aquifer at this site was estimated at 120 ft. After removal of the slug, the initial drop in the water surface was 4.08 ft. The table shows how the water level recovered as measured by a pressure transducer and datalogger. Find the hydraulic conductivity at this site in ft/d using the Bouwer and Rice method.

t (sec)	H_t (ft)
0	4.08
1	1.63
5	1.09
10	0.97
30	0.78
60	0.58
90	0.44
120	0.34
180	0.17
240	0.08
300	0.04
360	0.02
420	0.01

3. A step-drawdown test was performed to find the well-loss coefficient C for a pumping well. Using the data below, find the coefficients B [ft/gpm] and C [ft/(gpm)^2].

Step	ΔQ (gpm)	$\Delta(h_o-h)$ (ft)
1	45	3.30
2	45	5.31
3	30	6.10
4	40	7.00
5	25	7.22

4. Consider the situation in the figure below. An unconfined aquifer overlies a leaky confined aquifer, with an aquitard between. With the observed water levels in the wells, it is possible to calculate the leakage through the aquitard. The aquitard has a hydraulic conductivity of 3.0×10^{-6} cm/sec.
[a] Which way is water flowing through the aquitard? Calculate the specific discharge in m/d.
[b] The effective porosity of the aquitard is 0.32. Find the time of travel for a molecule of water to make it through the aquitard based on the seepage velocity.



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