

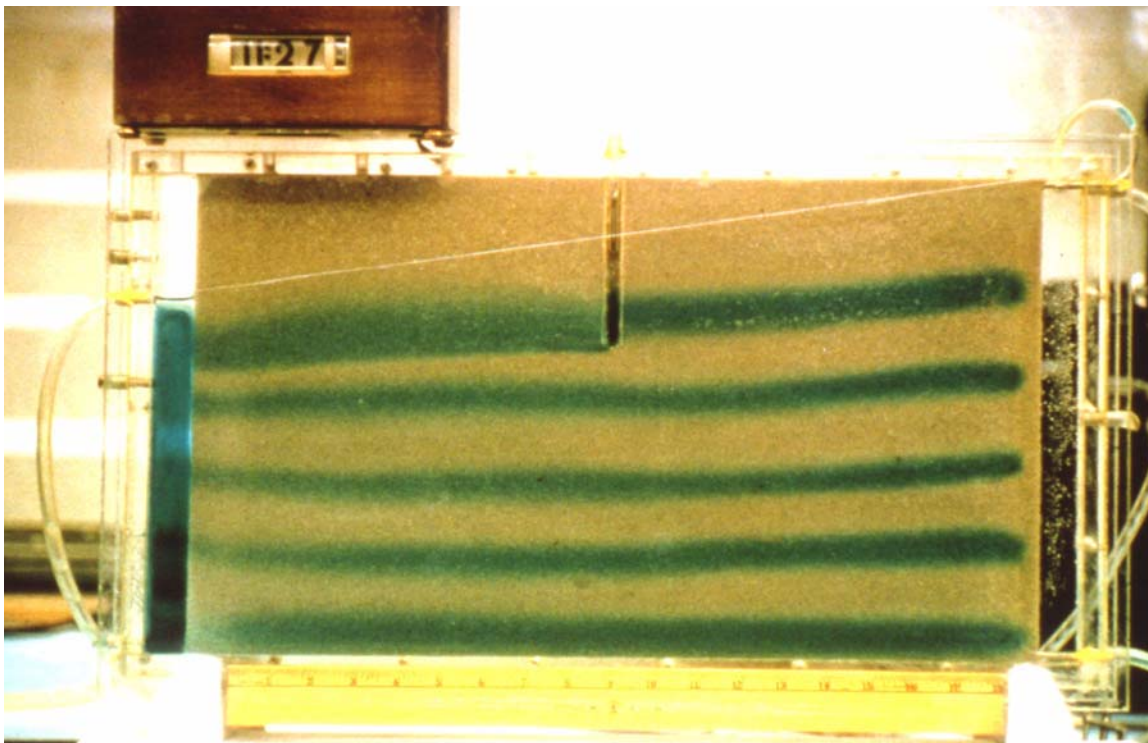
Fate and Transport Third Exam – 2007 (100/105)

Closed Book Section (30):

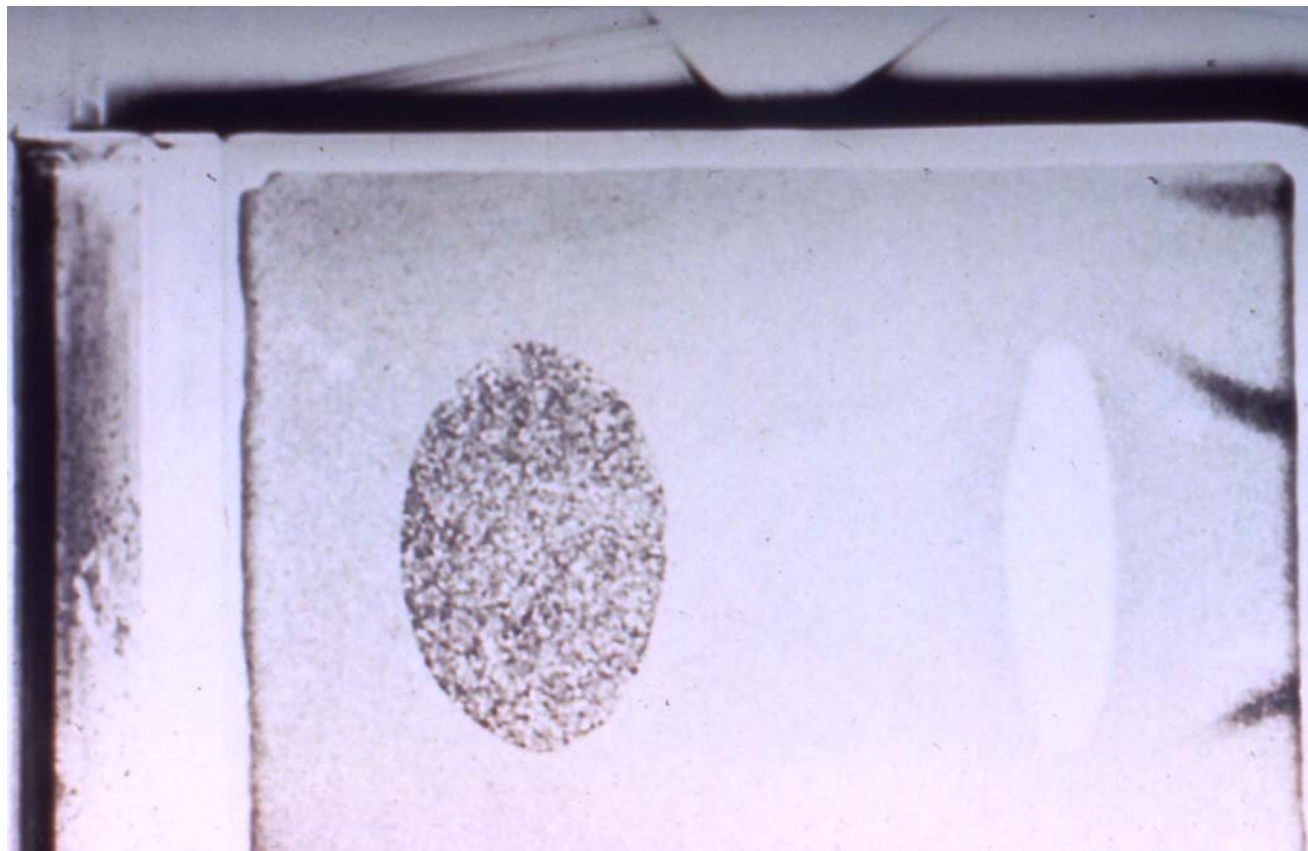
1. (10) If the $R_d=1$ contaminant went an average distance of 50 meters in 5 years. Exactly how far did the $R_d=8$ contaminant go in the same time period?



2. (10) Single well system, flow from right to left with no pumping. Show how it looks with pumping at steady state. How would the steady state figure change if the dye had a retardation factor of 2 and no decay.

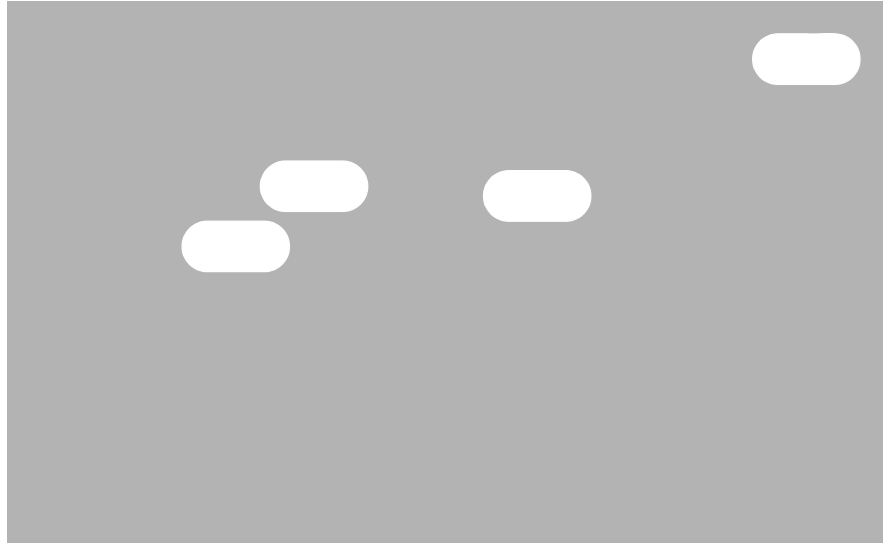


3. (10) Five lines of dye come in from the left side. How do they look at steady state?.



Open Book Section (75)

4. (25) The porosity is 0.333, the thickness of the aquifer is 7 meters, the pore velocity of the water is 5 m/yr, the bulk density is 1650 kg/m³. One of the four contaminants has an R_d of 1.0; the other contaminants have an $R_d > 1$. Label the retardation factor of each plume. Find the specific discharge for the figure. What pumping rate would capture a 50 meter wide plume from this system assuming the pumping well is far downstream from the source. When will the plume which has gone 25 meters reach 50 meters?



5. (30) For the disposal pit in Figure 7-22, estimate the distance of migration after a period of 10 years for chloride ion and a second contaminant with the given distribution coefficient (K_d)



6. (25) Both the batch reactor and the CSTR have one chemical reaction consisting of first order decay with constant k . The CSTR has a flow of Q (outflow same as inflow). Write the control volume equation for each one. Give a partial differ-



ential equation that would work for at least one class of plug flow reactor mass transport.