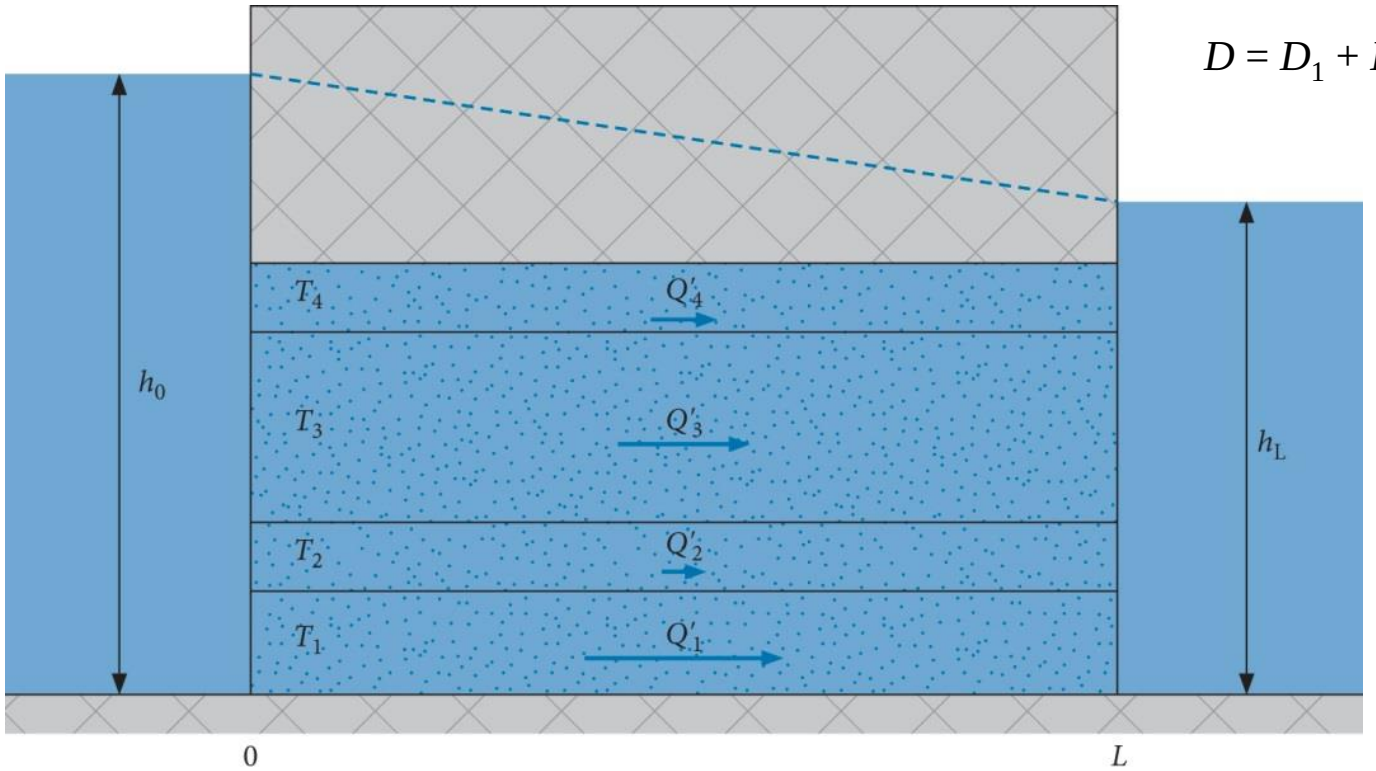
Horizontal groundwater flow

https://www.youtube.com/user/MartinRHendriks/videos



$$D = D_1 + D_2 + D_3 + D_4$$

$$Q' = Q'_1 + Q'_2 + Q'_3 + Q'_4$$

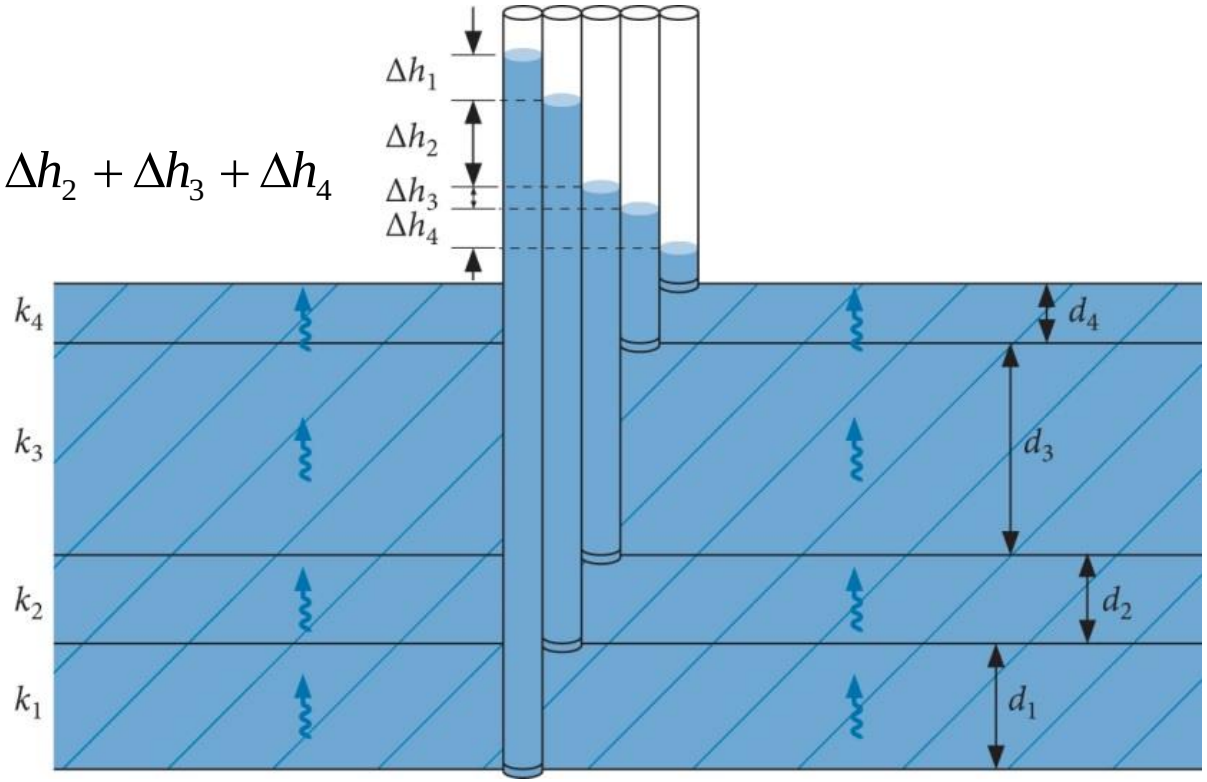
$$-KDi = -K_1 D_1 i - K_2 D_2 i - K_3 D_3 i - K_4 D_4 i$$

$$KD = K_1 D_1 + K_2 D_2 + K_3 D_3 + K_4 D_4$$

Vertical groundwater flow

https://www.youtube.com/user/MartinRHendriks/videos

$$\Delta h = \Delta h_1 + \Delta h_2 + \Delta h_3 + \Delta h_4$$



$$d = d_1 + d_2 + d_3 + d_4$$

Continuity equation: $Q = Q_1 = Q_2 = Q_3 = Q_4$

Vertical groundwater flow

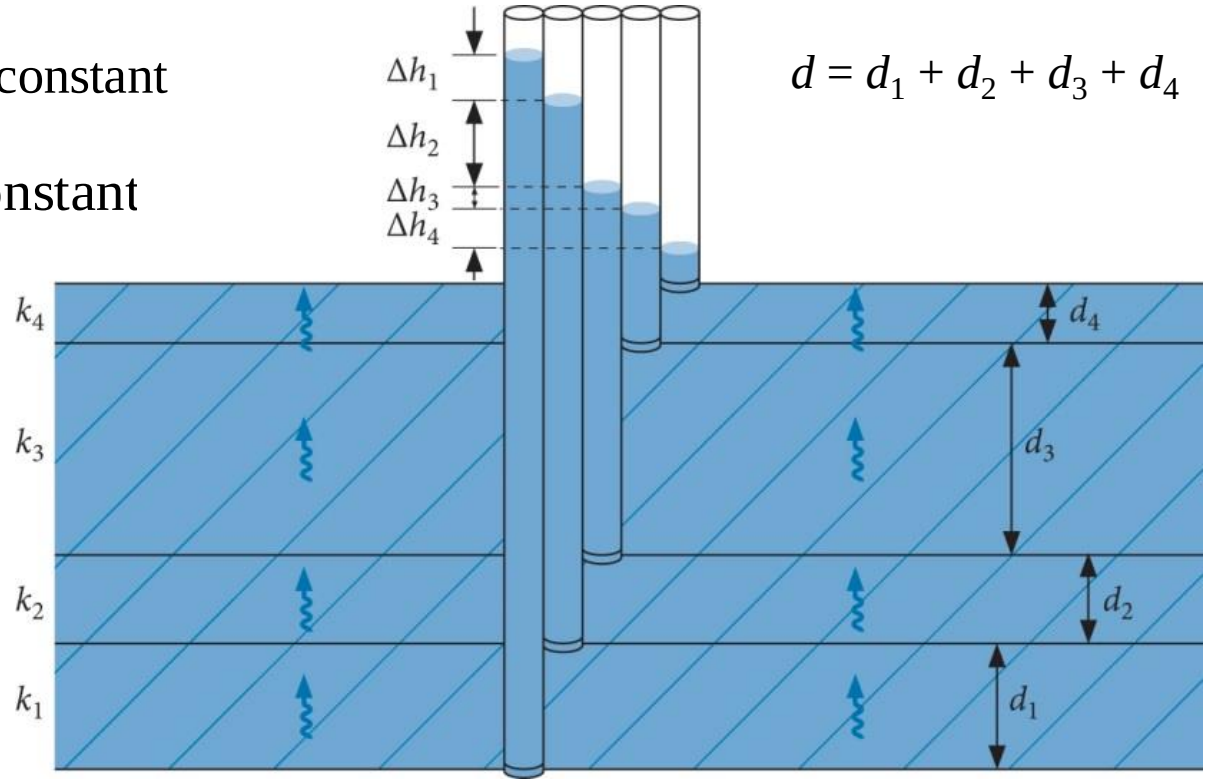
https://www.youtube.com/user/MartinRHendriks/videos

$$\frac{Q}{A} = \frac{Q_1}{A} = \frac{Q_2}{A} = \frac{Q_3}{A} = \frac{Q_4}{A} = \text{constant}$$

$$q = q_1 = q_2 = q_3 = q_4 = \text{constant}$$

$$\Delta h = \Delta h_1 + \Delta h_2 + \Delta h_3 + \Delta h_4$$

$$\frac{\Delta h}{q} = \frac{\Delta h_1}{q_1} + \frac{\Delta h_2}{q_2} + \frac{\Delta h_3}{q_3} + \frac{\Delta h_4}{q_4}$$



$$d = d_1 + d_2 + d_3 + d_4$$

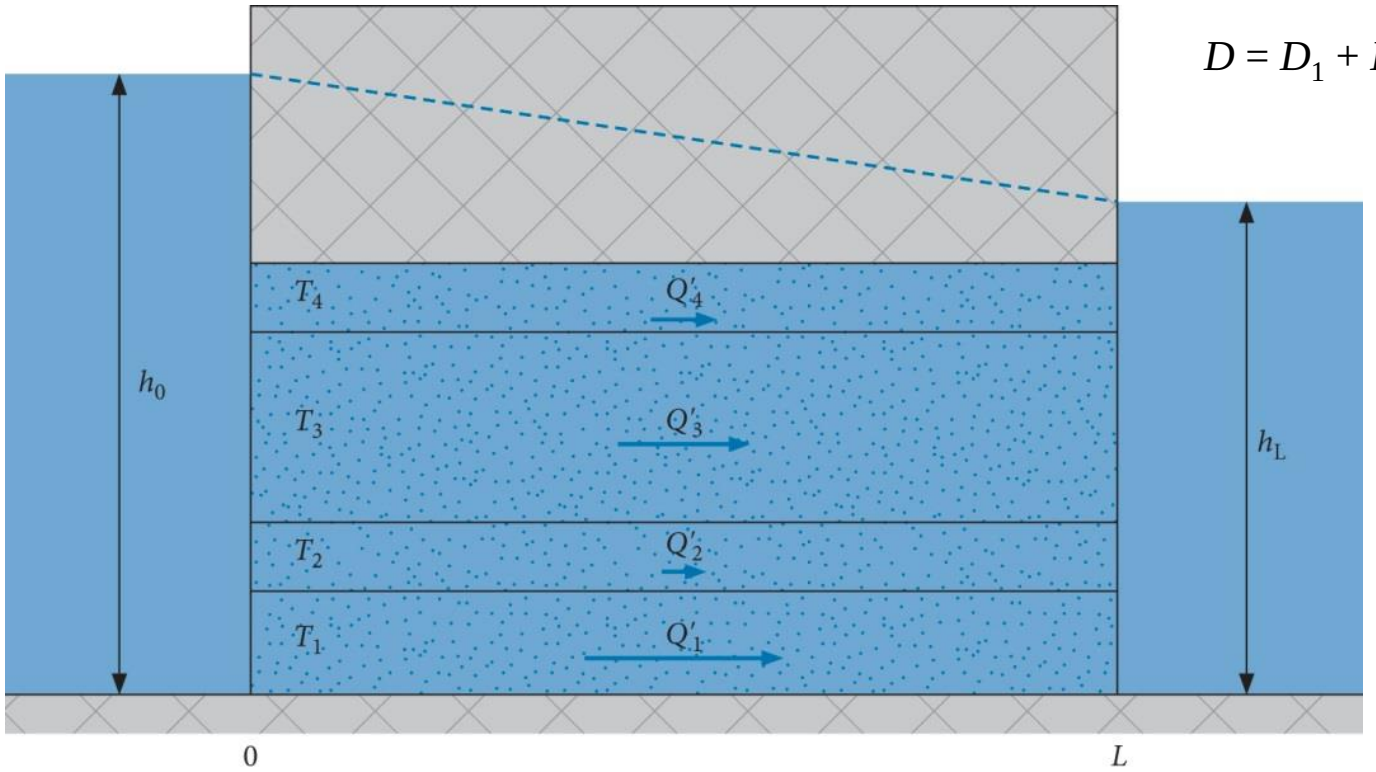
$$q = -k\frac{\Delta h}{d} = q_1 = -k_1\frac{\Delta h_1}{d_1} = q_2 = -k_2\frac{\Delta h_2}{d_2} = -k_3\frac{\Delta h_3}{d_3} = -k_4\frac{\Delta h_4}{d_4}$$

$$\frac{d}{k} = \frac{d_1}{k_1} + \frac{d_2}{k_2} + \frac{d_3}{k_3} + \frac{d_4}{k_4}$$

$$c = c_1 + c_2 + c_3 + c_4$$

Horizontal groundwater flow

https://www.youtube.com/user/MartinRHendriks/videos



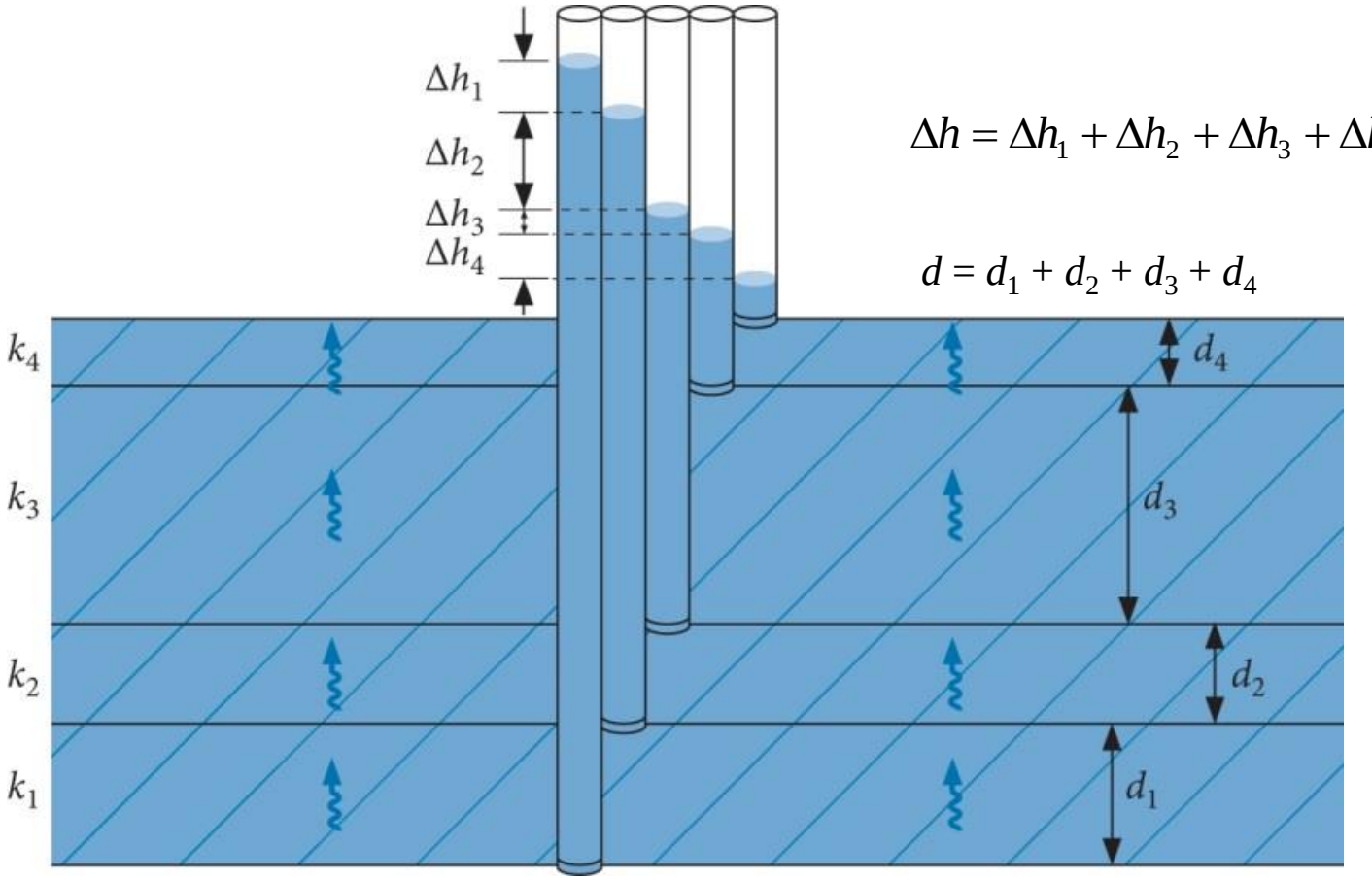
$$D = D_1 + D_2 + D_3 + D_4$$

$$Q' = Q'_1 + Q'_2 + Q'_3 + Q'_4$$

$$KD = K_1 D_1 + K_2 D_2 + K_3 D_3 + K_4 D_4$$

Vertical groundwater flow

https://www.youtube.com/user/MartinRHendriks/videos



$$\Delta h = \Delta h_1 + \Delta h_2 + \Delta h_3 + \Delta h_4$$

$$d = d_1 + d_2 + d_3 + d_4$$

$$q = q_1 = q_2 = q_3 = q_4$$

$$\frac{d}{k} = \frac{d_1}{k_1} + \frac{d_2}{k_2} + \frac{d_3}{k_3} + \frac{d_4}{k_4}$$

$$c = c_1 + c_2 + c_3 + c_4$$

Horizontal and vertical groundwater flow

https://www.youtube.com/user/MartinRHendriks/videos

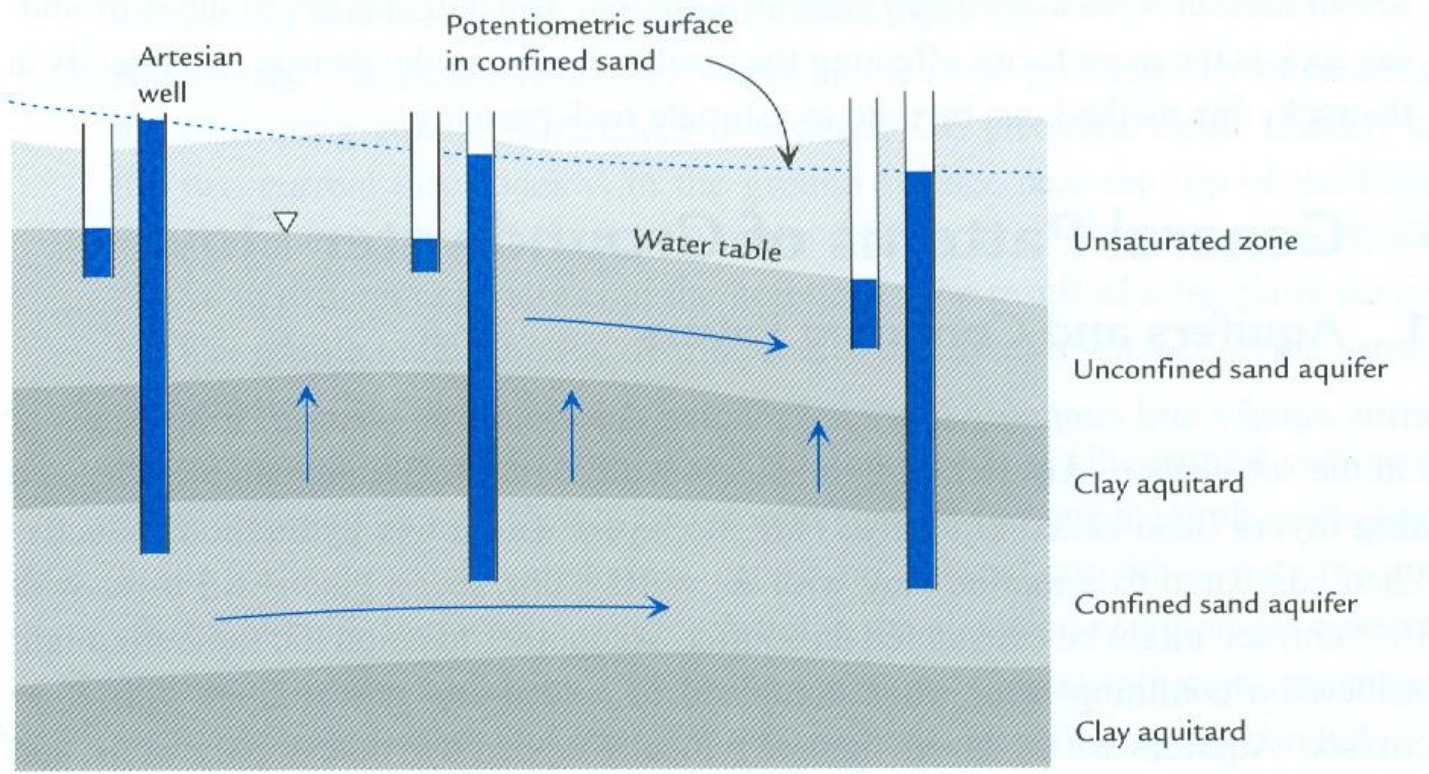


Figure 4.13 Vertical cross-section through an unconfined aquifer and a confined aquifer, with a confining layer separating the two. An artesian well is one where the water level rises above the ground surface.

Source: Fitts (2002)

References

https://www.youtube.com/user/MartinRHendriks/videos

Fitts, C.R. (2002). Groundwater Science. Academic Press, Elsevier Science.

Hendriks, M.R. (2010). Introduction to Physical Hydrology. Oxford University Press.