

ES476 Hydrology – Groundwater Equations One-Stop-Shop to Emphasize

I. Aquifer Properties

https://people.wou.edu/~taylors/es476_hydro/gwatreq1.pdf

- a. Work (W) = F D joules $\text{kg}\cdot\text{m}^2/\text{sec}^2$
- b. Force (F) = m a newtons $\text{kg}\cdot\text{m}/\text{sec}^2$
- c. Weight (Wt) = m g newtons $\text{kg}\cdot\text{m}/\text{sec}^2$
- d. Density (D) = m / vol kg / m^3
- e. Specific Weight = m g / vol N / m^3
- f. Pressure (P) = F / A = wt / A $\text{N} / \text{m}^2 = \text{Pascals Pa}$
- g. Porosity (total porosity vs. effective porosity) (n) = vol. pore / vol. total % percentage
- h. Specific Yield (S.Y.) = % water released from pores via gravity % percentage
- i. Retention Yield (R.Y.) = % water retained in pores via surface tension % percentage

II. Groundwater Flow Equations

https://people.wou.edu/~taylors/es476_hydro/gwatreq2.pdf

- a. Darcy Law $Q = KIA$ $\text{L}^3/\text{t} = \text{L}/\text{t} \text{ L}^2$
- b. Hydraulic Conductivity $K = Q / (IA)$ $\text{L}/\text{t} \text{ cm} / \text{sec}$
- c. Transmissivity = K b L^2/t
- d. Darcy Flux $V = Q / A = KI$ L / t
- e. Seepage Velocity = KI / n L/t
- f. Hydraulic Gradient = $I = \text{head} / \text{distance}$ L / L
- g. Head = water level difference = h L
- h. Storativity = s = percent water released from aquifer storage

III. Well Hydraulics Equations

https://people.wou.edu/~taylors/es476_hydro/gwatreq3.pdf

- a. SWL = static water level z = elevation
- b. PWL = pumping water level z = elevation
- c. Drawdown (s) = SWL – PWL length
- d. Well Yield = sustained well discharge via pumping at equilibrium PWL = Vol / time L^3 / t
- e. Specific Capacity = Well Yield / s $\text{L}^3 / \text{t} / \text{L}$
- f. Hydraulic Conductivity $K = Q / IA$ L / t
- g. Transmissivity = K b L^2 / t