Considerations in reference to Eq. 5.6.8

$$R\frac{\partial C}{\partial t} = D\frac{\partial^2 C}{\partial x^2} + v\frac{\partial C}{\partial x} - \lambda RC$$

$$\frac{\partial C}{\partial t} = \frac{D_{xx}}{R}\frac{\partial^2 C}{\partial x^2} + \frac{v_{xx}}{R}\frac{\partial C}{\partial x} - \lambda C \qquad (1\text{-}D)$$

1 ▷ Could be expanded to 2-D and 3D, by adding D_{yy} & D_{zz} and v_{xx} & v_{zz}

2 ▷ If (transport is steady-state : $\frac{\partial C}{\partial t} = 0$.

3 ▷ If $Kd = 0$ (non-sorbing contaminant) : $R = 1$

4 ▷ If $\lambda = 0$ (non-reactive contaminant) : $\lambda C = 0$

5 ▷ If contaminant reacts by various mechanisms (e.g., oxidation, complexation), add each additional rate expression

$$-\lambda_1 C - \lambda_2 C^2 - \ldots$$

6 ▷ If dispersion is neglected : $D\frac{\partial^2 C}{\partial x^2} = 0$ (advection controls)

7 ▷ If advection is neglected : $v\frac{\partial C}{\partial x} = 0$ (dispersion → diffusion CONTROLS)

Chabernaud, 2000