

For scenarios where the contaminant exists only in the aqueous or solid-sorbent phases and where no contaminant decays into another contaminant (progeny), the total mass loss rate due to decay and leaching is given as follows (Eqs. 3.11 and 5.105, http://mepas.pnl.gov/earth/formulations/source_term/source_form.html):

$$\frac{dM_i}{dt} = -\left(\lambda_i M_i + \frac{q_w M_i}{\theta_w R_i z}\right)$$

The first term on the right-hand side is the mass loss due to radioactive decay. The second term is the mass loss due to leaching.

The solution for the mass remaining in the inventory as a function of time is given as follows:

$$M_i(t) = M_{i0} \exp\left[-\left(\lambda_i + \frac{q_w}{\theta_w R_i z}\right)t\right]$$