# Approximation of the inventory volume integral

Here is a quick overview of the approximation used to compute the volume integral :

The mass of tritium present at the site (in units of activity i.e. Ci) can be computed as follows :

where n is the porosity and C is the activity concentration. The domain for this integral corresponds to the drainage area downgradient of the F-area seepage basins and the aquifers below. The domain is not a regular polyhedron, and we do not know the integrand at every point :

The first approximation is the use of and average porosity over the whole domain :

$m\_{tritium}\approx\frac{1}{V\_{tot}}\iiint\_D n(x,y,z)dxdydz \cdot \iiint\_DC(x,y,z)dxdydz \\ m\_{tritium}\approx \bar{n} \int\_DC(x,y,z)dxdydz$

The second approximation comes from the fact that we do not know the concentration at every x,y and z. We know for a fact that the concentration is not uniform in z, but the measurements collected provide the concentration average over the screen length , which in most cases we can replace by the aquifer thickness in the case of fully penetrating wells i.e.:

$m\_{tritium}\approx \bar{n} \iint\_{D\_{xy}}\left(\int\_{h}C(x,y,z)dz\right)dxdy \\ m\_{tritium}\approx \bar{n} \iint\_{D\_{xy}}\overline{C\_z(x,y)}h(x,y)dxdy$

There are several ways to deal with that final integral. One can look at the available samples for and , and use a bootstrap estimate to provide mean and standard errors. We approximate the intergral by a point by point computation using an interpolant on a regular grid :

$m\_{tritium}\approx \bar{n} \sum\_{i,j}\overline{C\_z(x\_i,y\_j)}h(x\_i,y\_j)A\_{ij} \\ m\_{tritium}\approx \bar{n} A\_{tot} \frac{1}{n\_in\_j} \sum\_{i,j}\overline{C\_z(x\_i,y\_j)}h(x\_i,y\_j)$

As one can see this is equivalent to computing a mean of the population and multiply this by the total area. This estimate could be obtained by Monte-Carlo Integration