Argonne NATIONAL LABORATORY

Subsurface DCGL

Effects of Thickness, Area, and Cover

C. Yu, D. LePoire, S. Kamboj, E. Gnanapragasam

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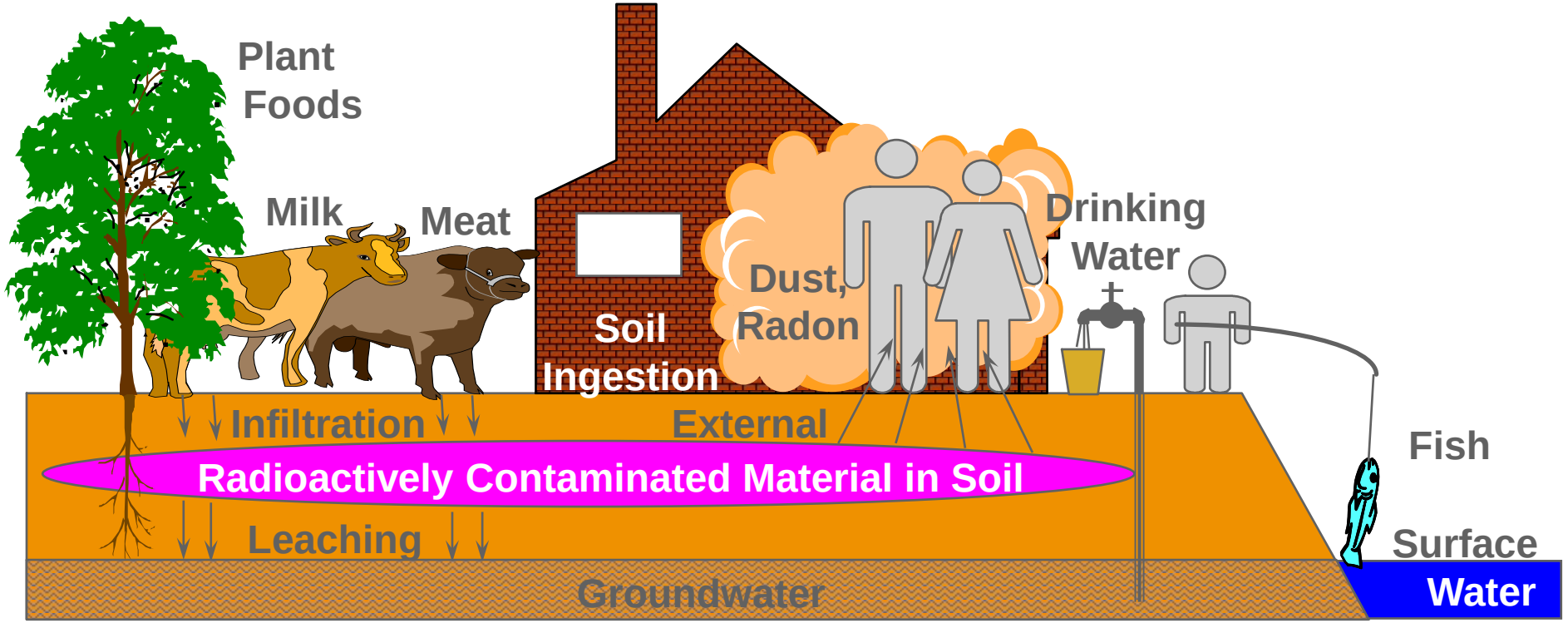
U.S. DEPARTMENT OF ENERGY

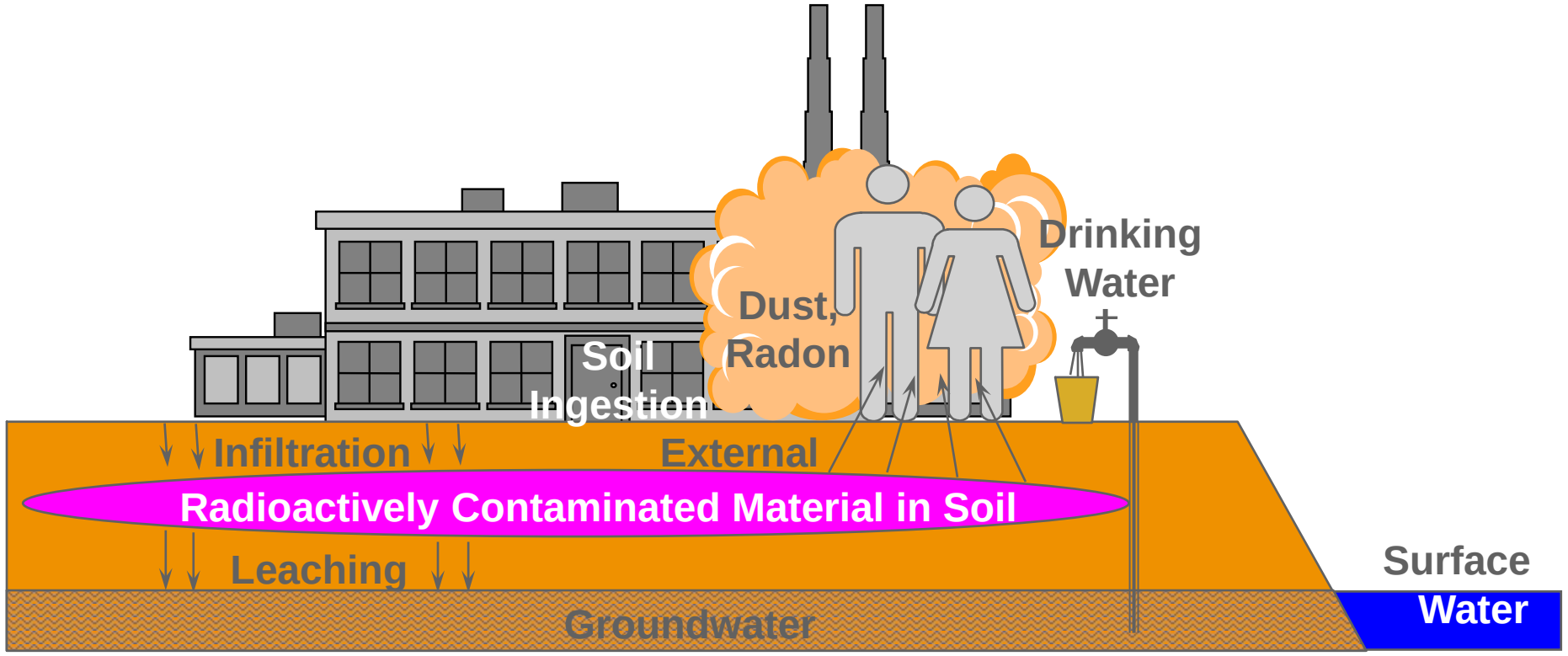
DCGL Considerations and Assumptions

- One of two ways to demonstrate compliance
- Based on regulatory dose criterion (e.g., 25 mrem/yr)
- Site-specific exposure scenarios and parameters
- Need to define contamination geometry/volume (i.e., area and thickness)
- Contamination is homogeneous (uniform) with or without a clean cover
- All pathways applicable to the exposure scenario need be included

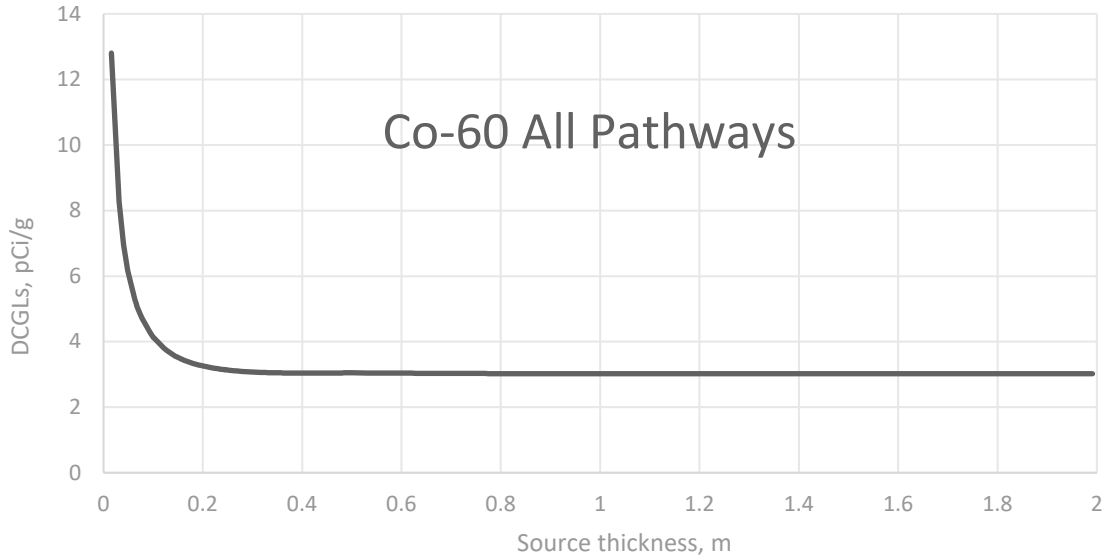
Resident Farmer Scenario

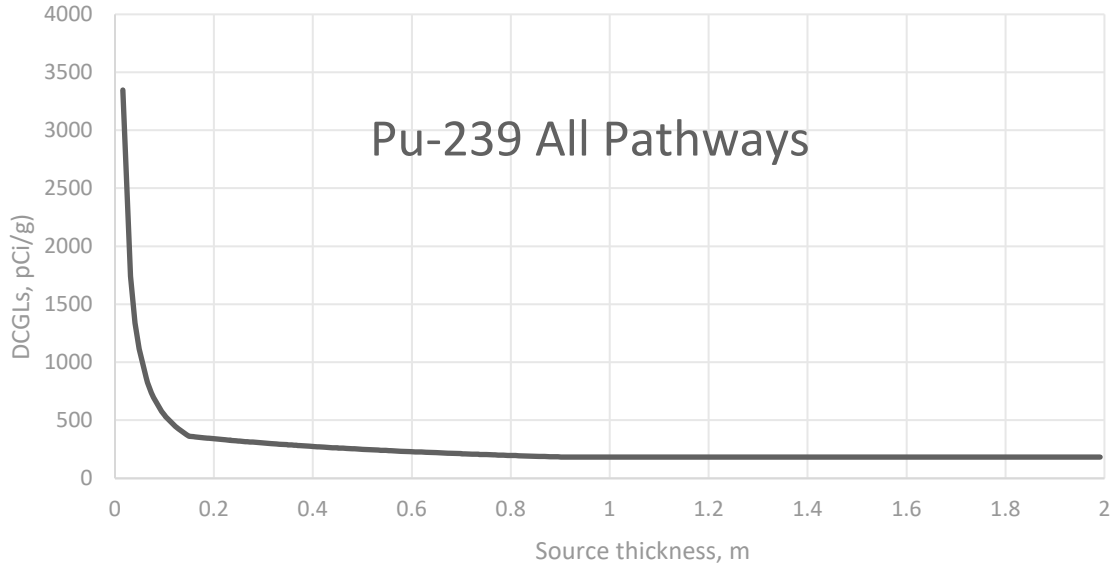


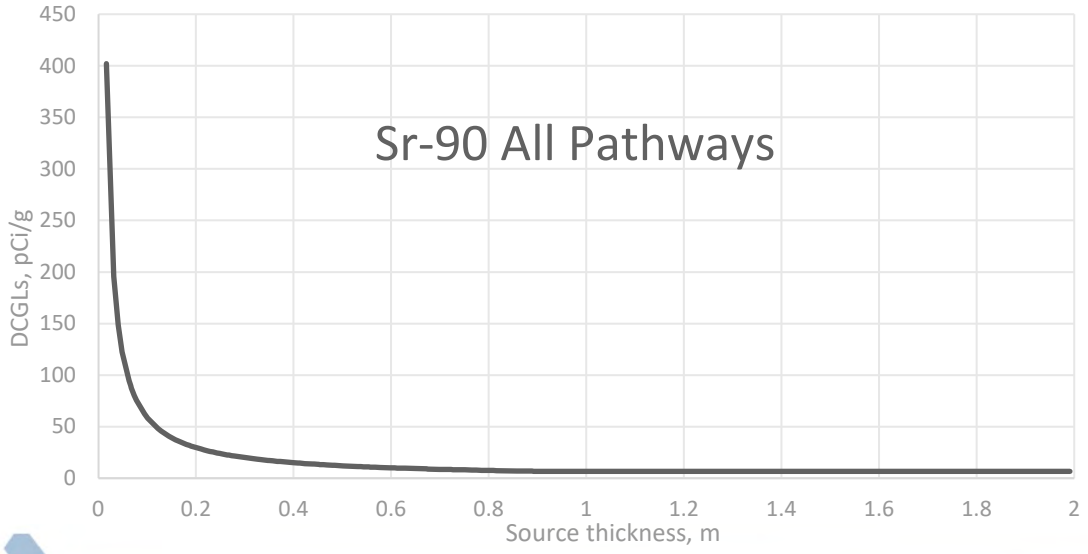
Industrial Use Scenario

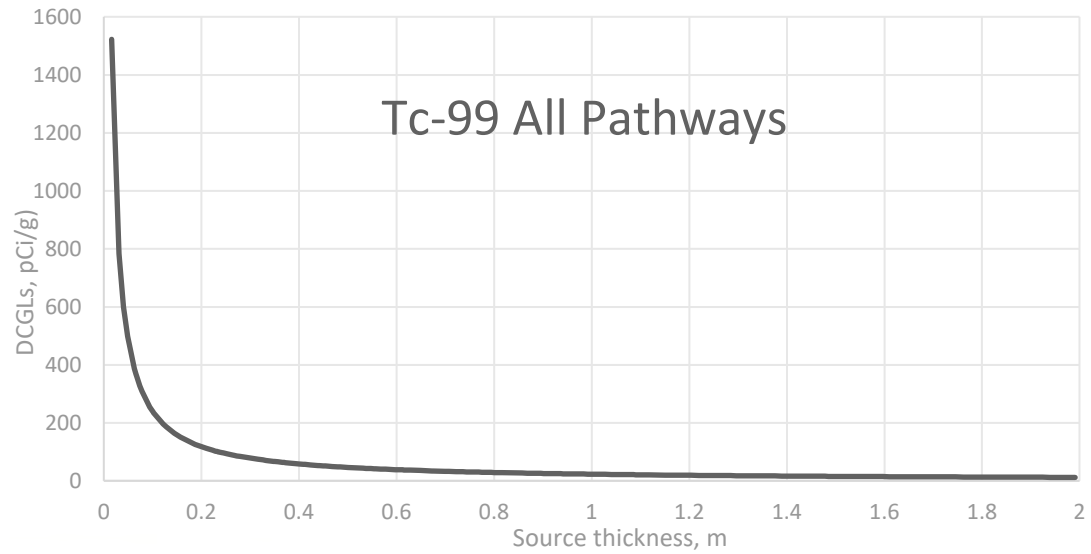


Effect of Source Thickness on DCGLs (Linear-Linear Scale, based on 25 mrem/yr, 10000 m², no cover)

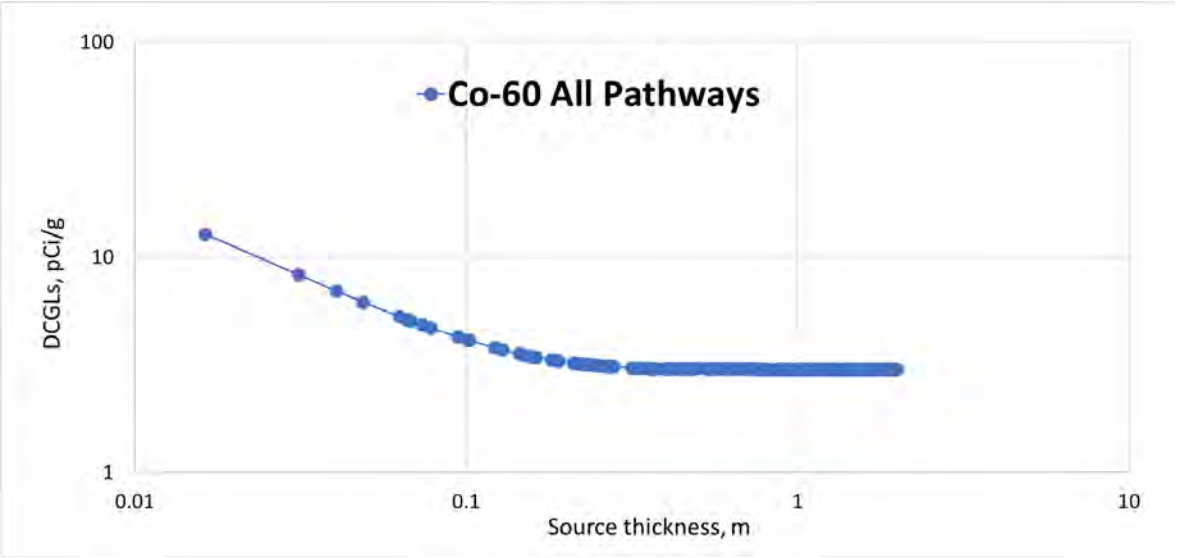


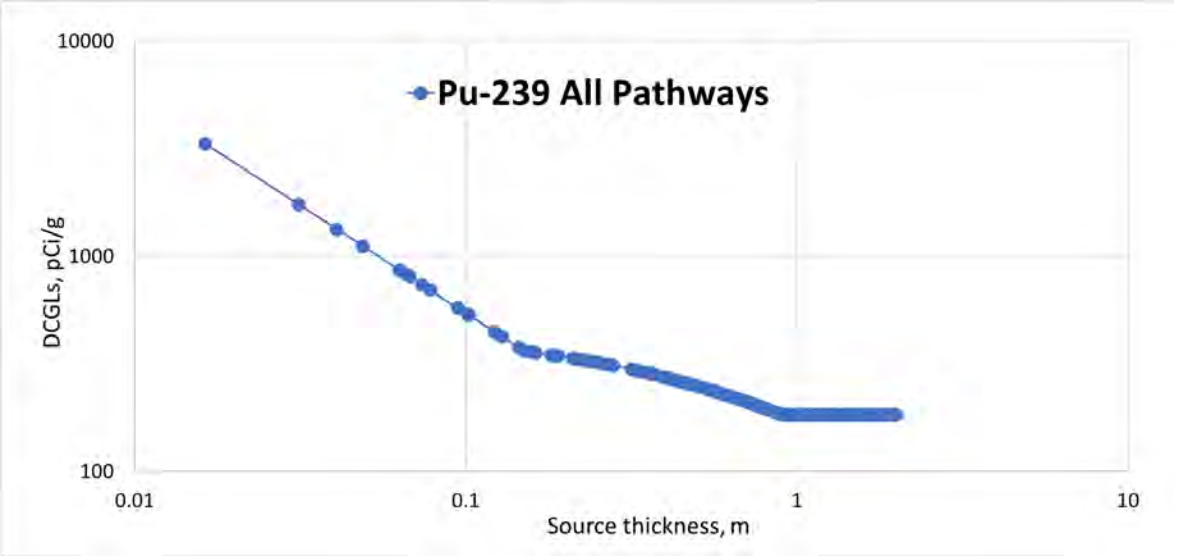


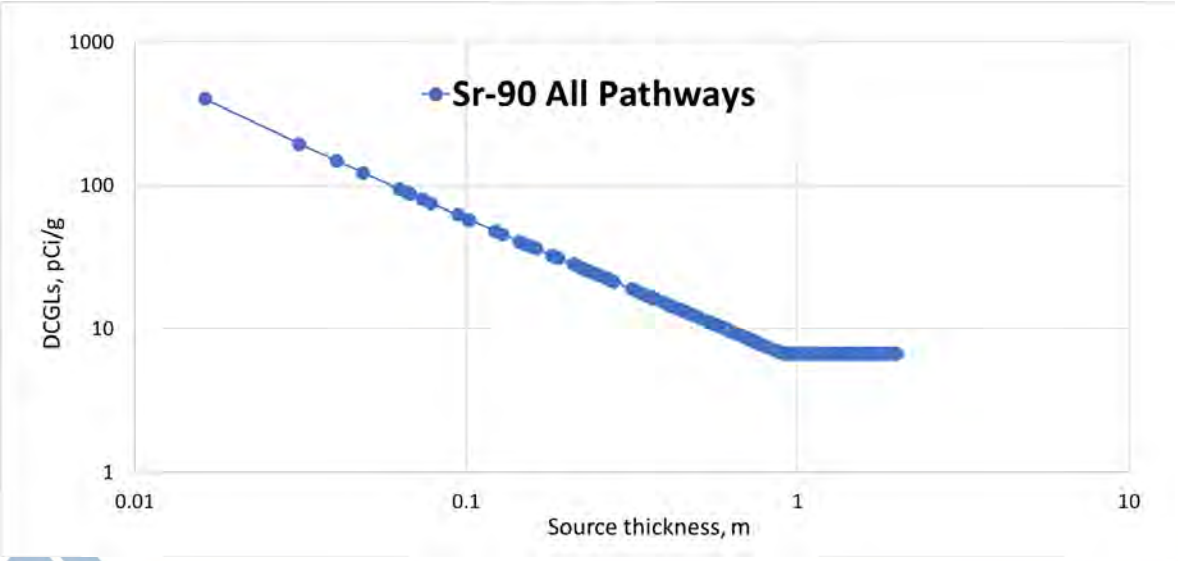


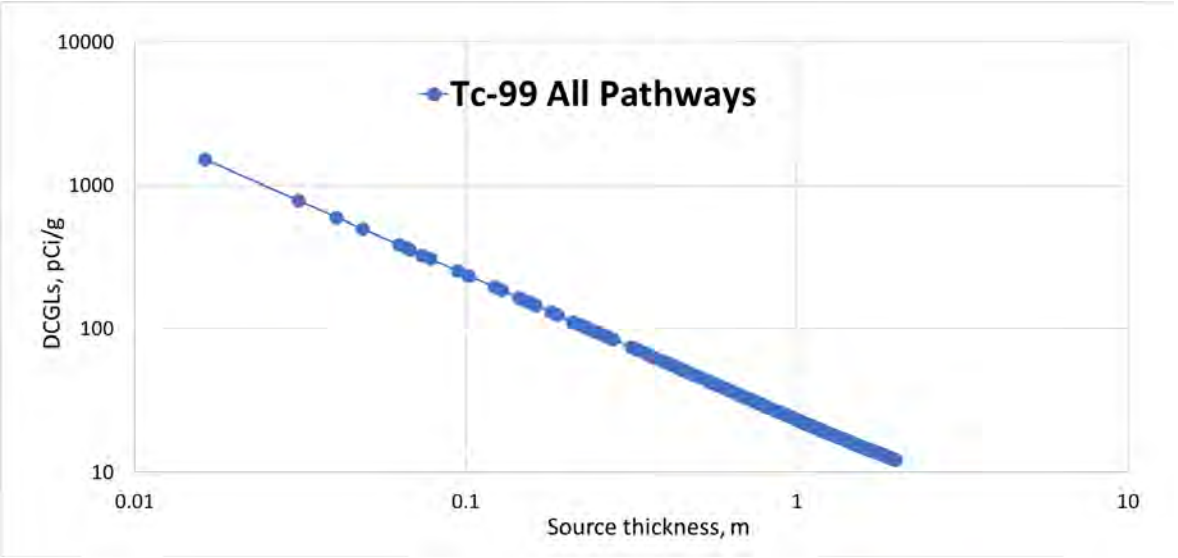


Effect of Source Thickness on DCGLs (Log-Log Scale, based on 25 mrem/yr, 10000 m^2, no cover)

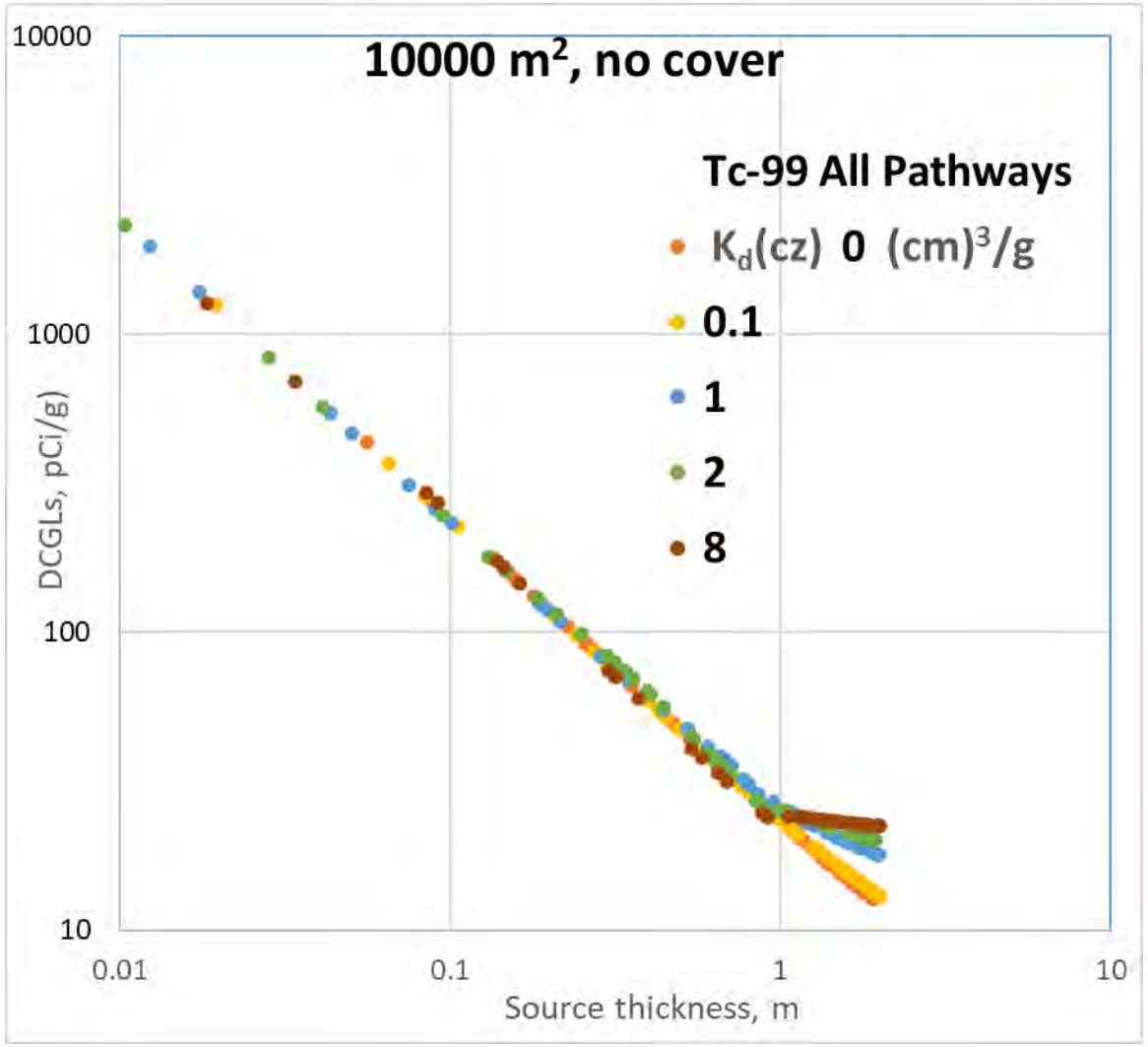


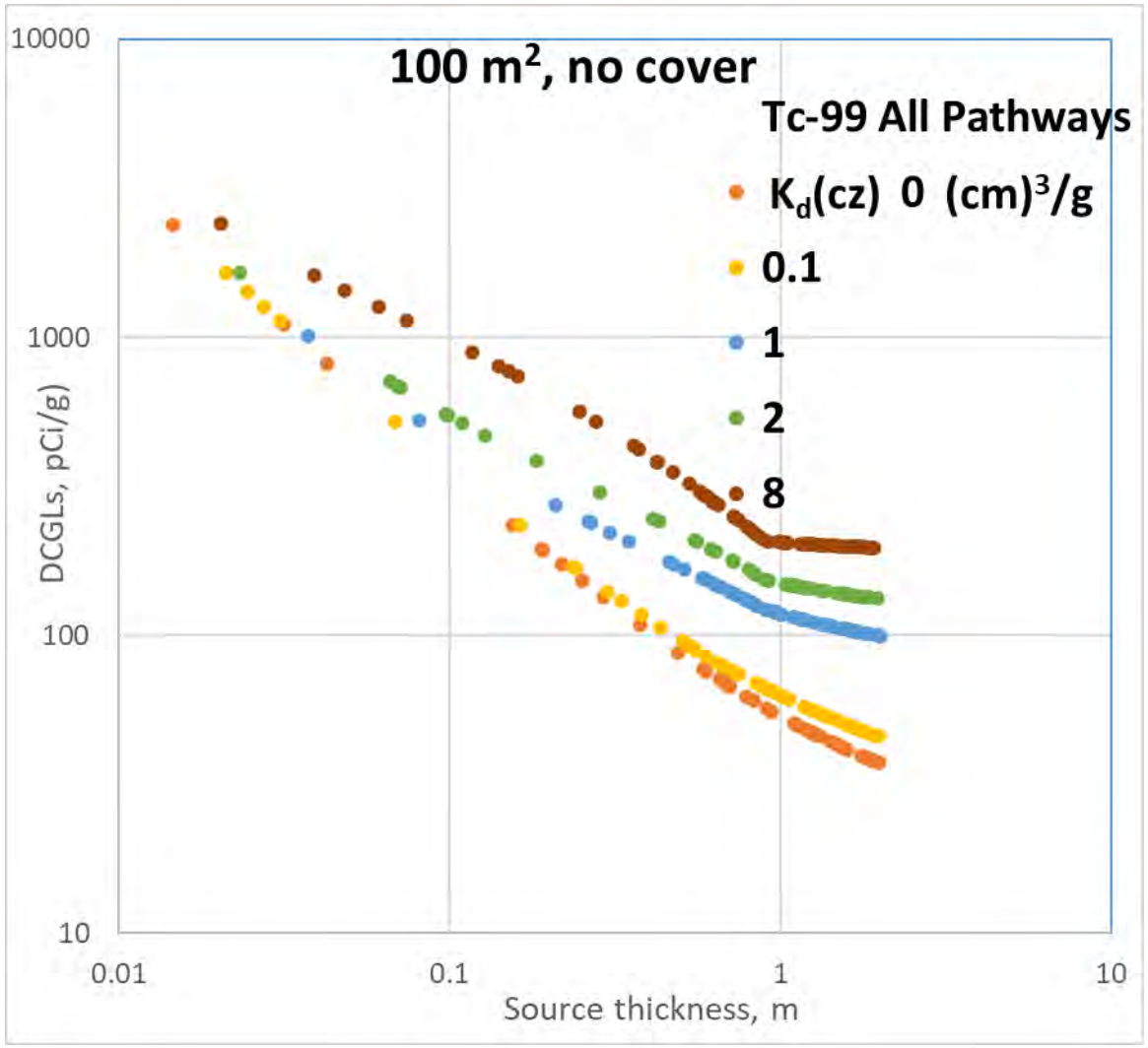




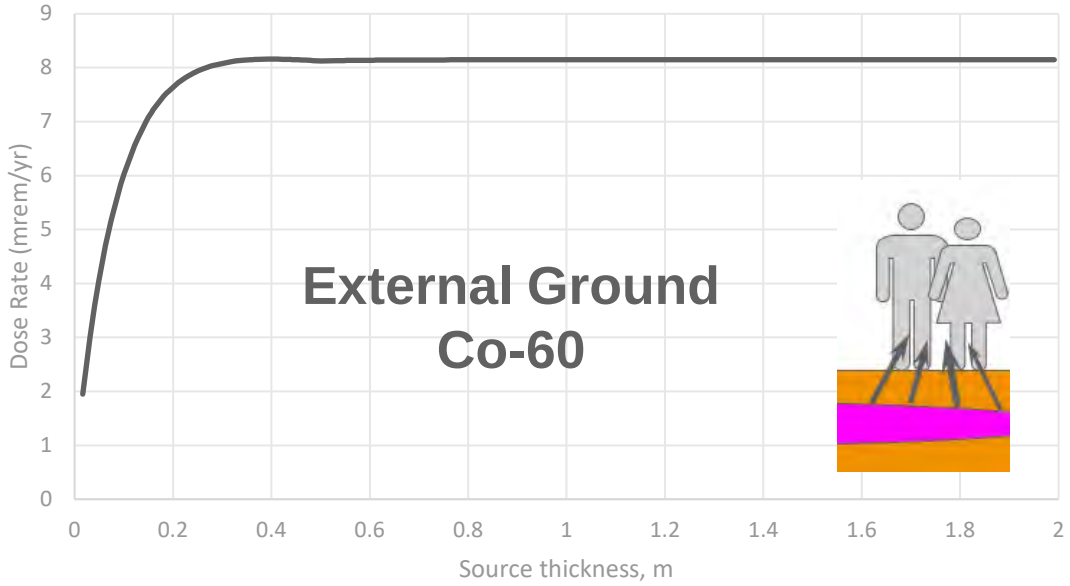


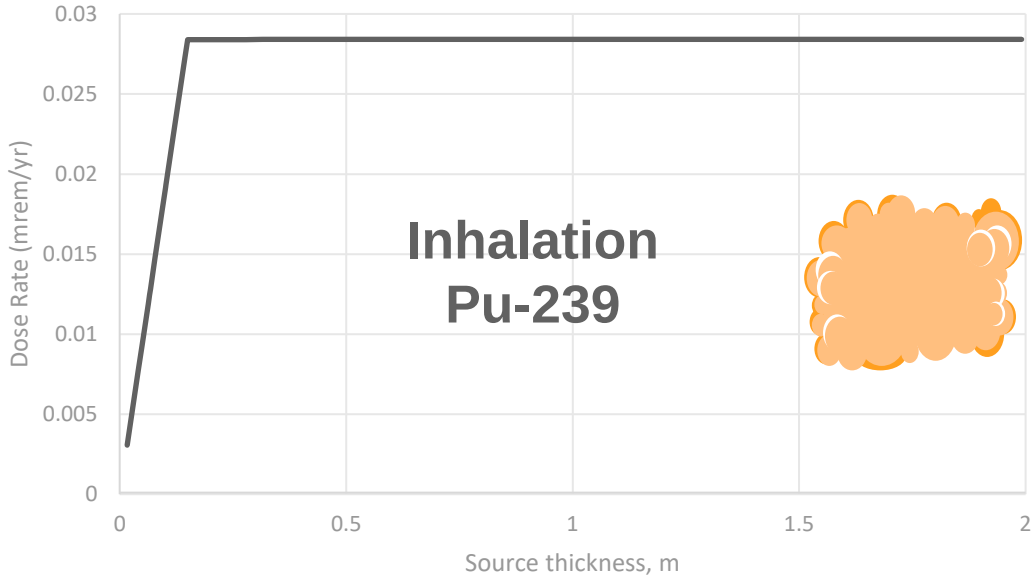
Effect of Distribution Coefficient on DCGLs (based on 25 mrem/yr)

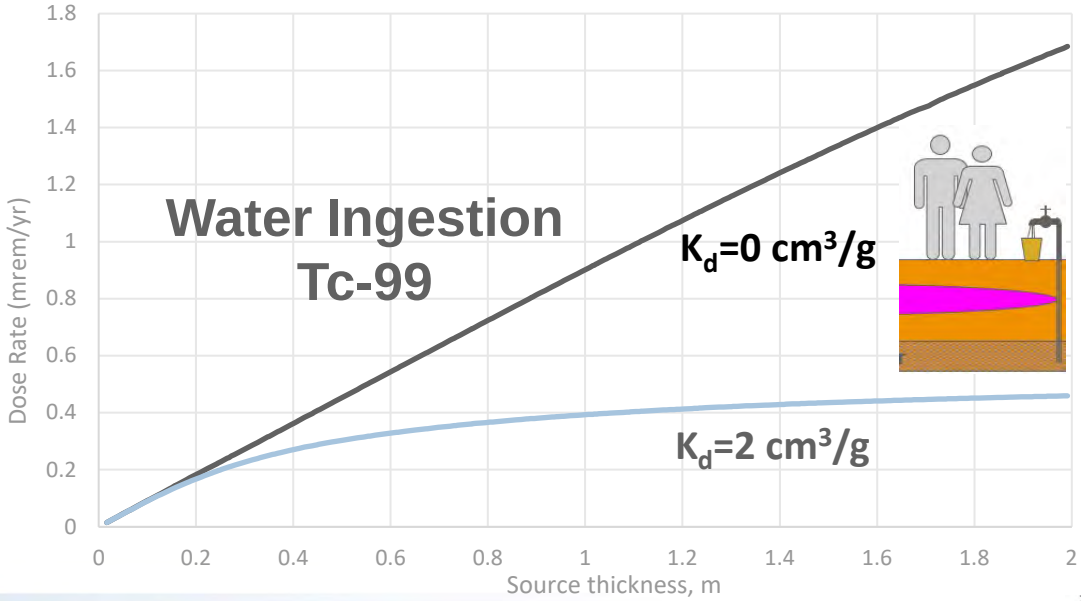




Effect of Source Thickness on Pathway Doses

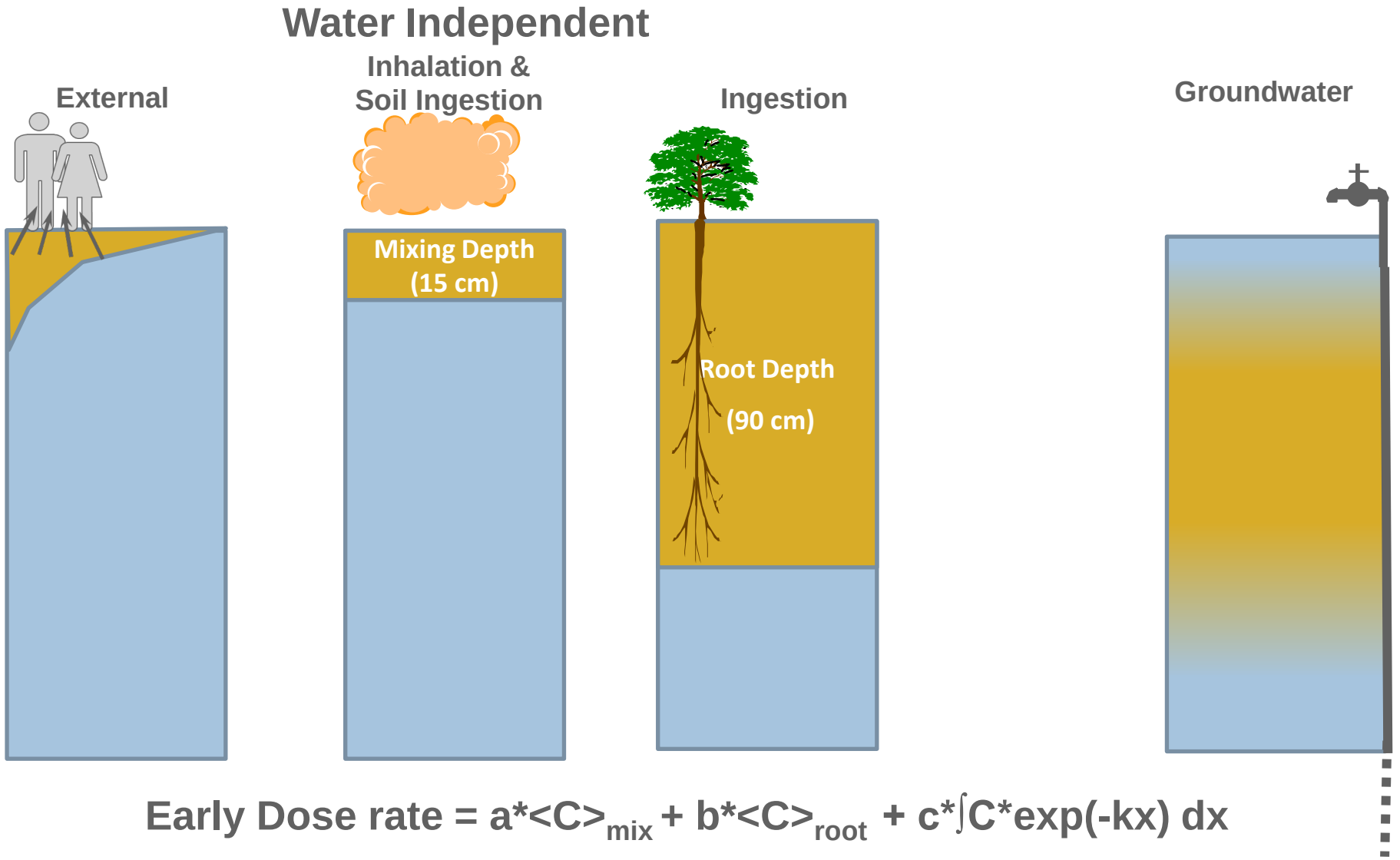






(with uniform concentration, 10000 m2, no cover)

Simplified Depth Dependence of Pathways

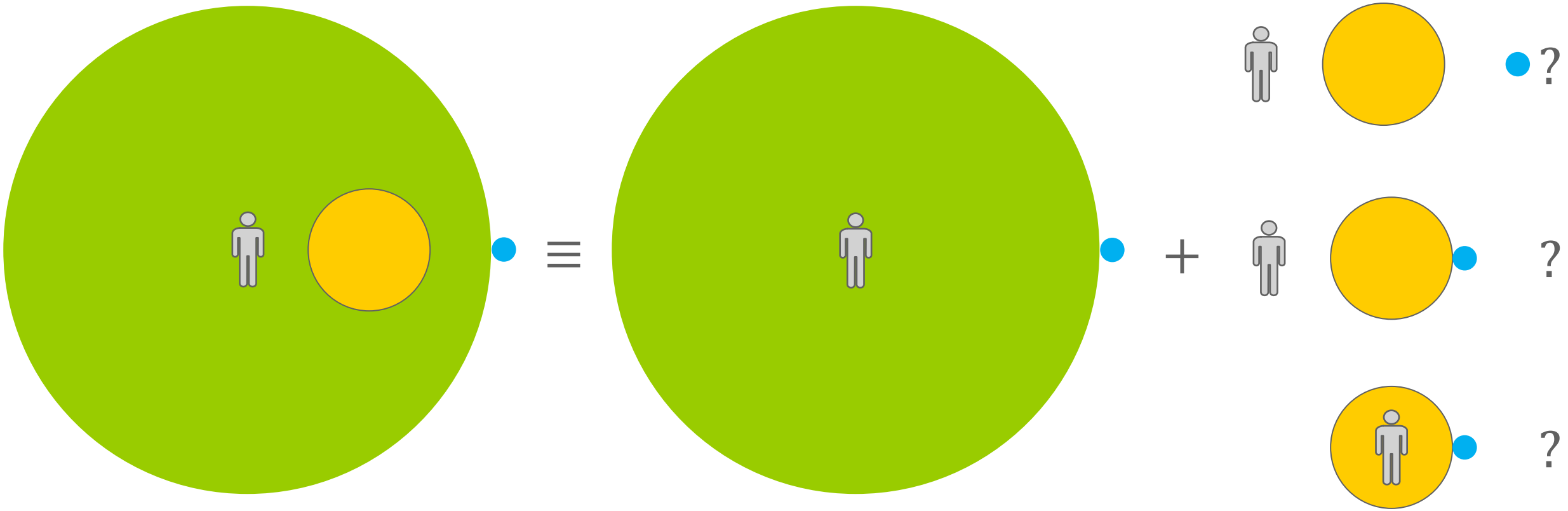


$$\text{Early Dose rate} = a*\langle C\rangle_{mix} + b*\langle C\rangle_{root} + c*\int C*\exp(-kx)\,dx$$

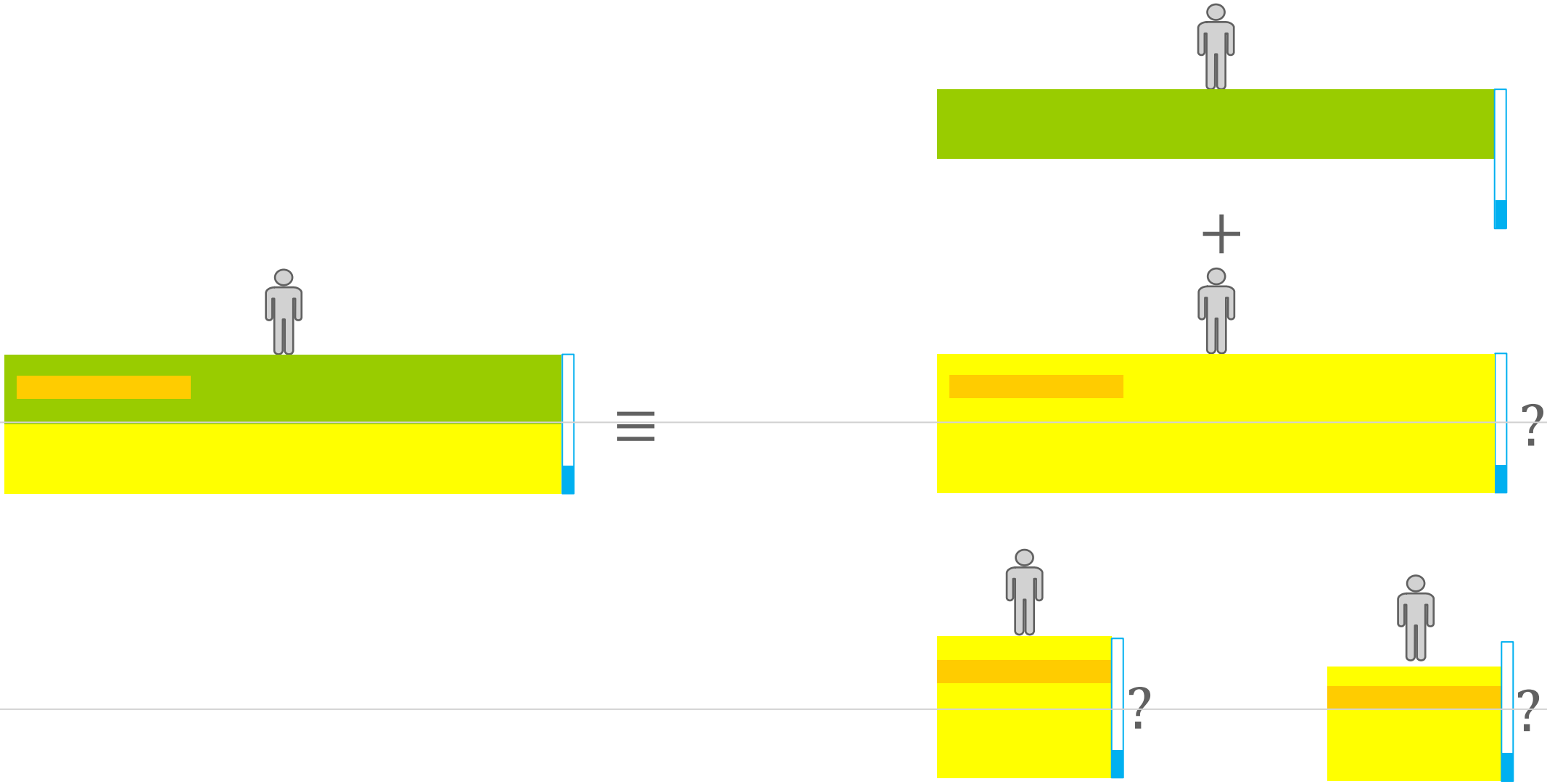
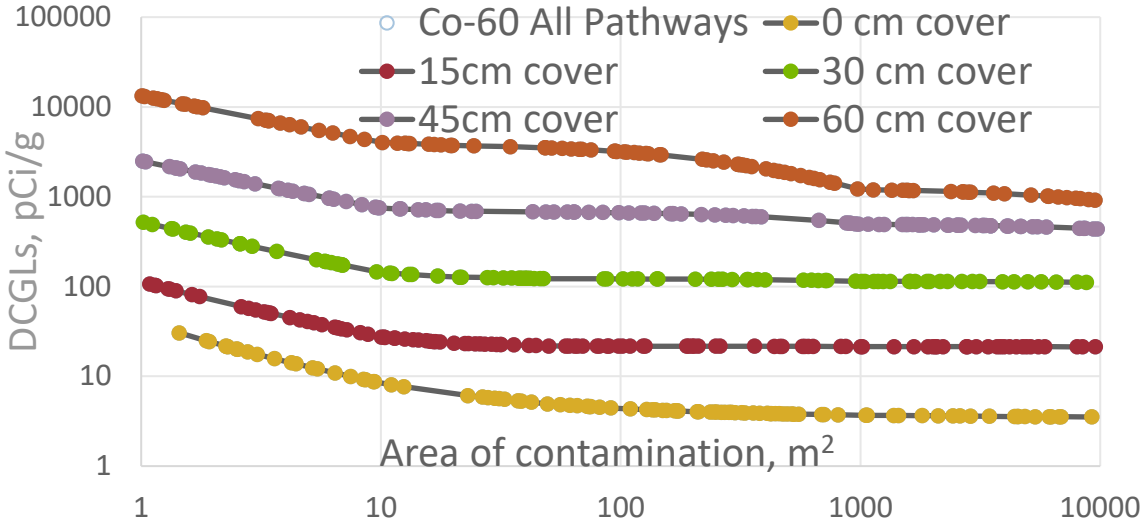
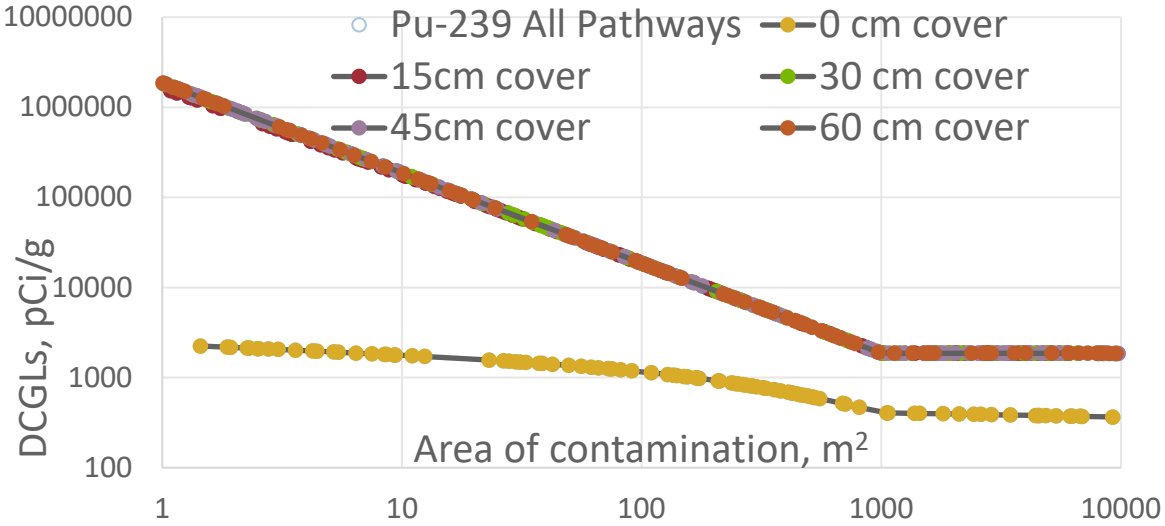
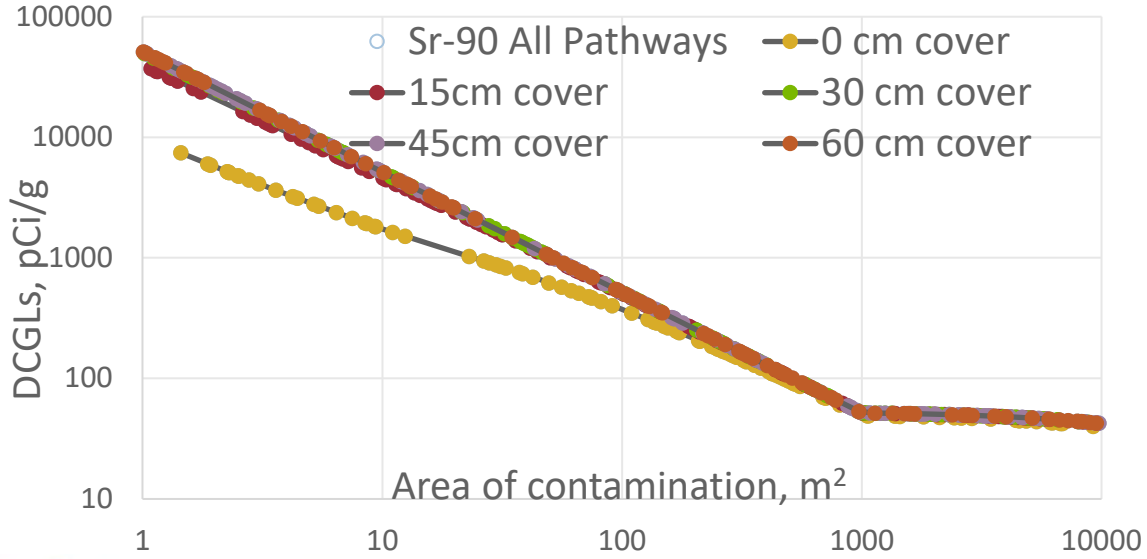
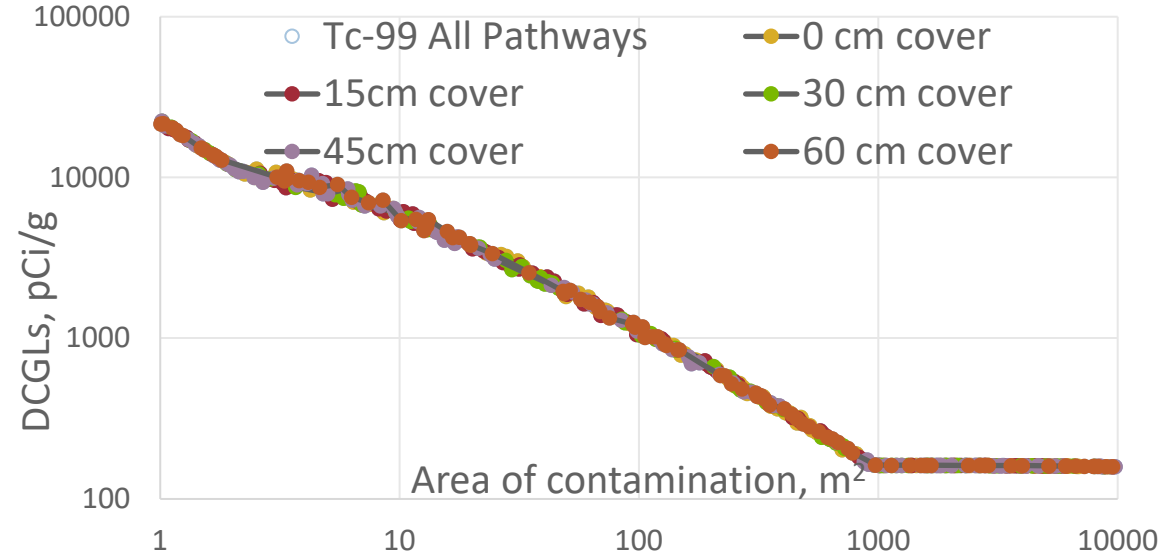
$$\text{Later Dose rate} = d*Q$$

(Also need to consider: decay and ingrowth, cover)

Spatial Characterization – Area Factor Consideration



Spatial Characterization – Depth Factor Consideration



DCGLs with15 cm Contamination at Different Depths (Cover) as Function of Area