Beaverlodge scenario - ERICA

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Phase 1 Objective

- Predict activity concentrations in whole body:
  - White Sucker
  - Lake Whitefish
  - *Chironomus riparius*
  - Pisidium sp.




Calculation

Aquatic

$$CR = \frac{\text{Activity concentration in biota whole body (Bq kg}^{-1}\text{ fresh weight)}}{\text{Activity concentration of filtered water (Bq l}^{-1}\text{)}}$$

ERICA database

Analytical results given in scenario (min, mean, max)

Concentration Ratio

- Selected ERICA reference organism CR based on biology
  - Lake Whitefish & White Sucker = pelagic fish
  - Chironomus = insect larvae
  - Pisidium = bivalve mollusc

Use an available CR value for an organism of similar taxonomy within that ecosystem for the radionuclide under assessment (Code 1; a preferred option)

Examples of application to derive default values in the ERICA databases are: applying macroalgae value to marine vascular plant; assuming pelagic fish value for benthic fish; assuming values for (e.g.) flying insects are applicable to other terrestrial invertebrate reference organisms. Note where there was more than one available value for different taxonomically similar reference organism then the highest available CR was generally used to provide missing values.

Use an available CR value for a similar reference organism (e.g. another vertebrate if require data for a reptile) (Code 2; preferred option)

Examples of application to derive default values in the ERICA databases are: applying available CR values for one vertebrate reference organism to other vertebrate reference organisms; assuming available marine invertebrate reference organism CR values are applicable to the reference organism sea anemone. Note where there was more than one available value for different similar reference organism then the highest available CR was generally used to provide missing values.

Use CR values recommended in previous reviews or derive them from previously published reviews (Code 3; preferred option)

In some instances, it was necessary to use broad reviews of stable element concentrations in media and biota to derive CR values or adopt previously recommended values without being able to go back to the source reference to confirm these.

Use specific activity models for ^{3}H and ^{14}C (Code 4; preferred option)

Specific activity models were used to derive ^{3}H and ^{14}C CR values for all reference organisms in terrestrial ecosystems (i.e. no values were based on observed data).

Site 13 - Dubyna Lake (shallow)

- No analytical data available for activity concentration in water
- Used ERICA K_d values to convert activity in sediment to activity in water

$$K_d\ (\mathrm{l\,kg^{-1}}) = \frac{\text{Activity concentration in sediment (Bq kg}^{-1}\text{ dry weight)}}{\text{Activity concentration in water (Bq l}^{-1}\text{)}}$$

ERICA – checked results

- Tier 2 freshwater model
- Entered organism geometries as per scenario
- ERICA requires a minimum mass of 0.001g for aquatic organisms
  - used this for Chironomus & Pisidium

Table 1. Geometry and mass of species of interest in the Phase I modelling exercise.

	Geometry (mm) lengthxwidthxdepth	Mass (g)
White Sucker	450x15x10	1191
Lake whitefish	436x14x10	1362
Chironomus riparius	0.34x0.17x0.15	0.00012-0.0002[1]
Pisidium sp.	5x1.5x1[2,3]	0.0009-0.0016[2]

[1] Beaty & Hendricks 2004
[2] Kilgour & Mackie1991
[3] Funk & Reckendorfer 2008

Phase 2

- Determine absorbed weighted dose rates, given whole body activity concentrations in biota
  - Calculate site specific K_d and CR based on Phase 1 input data?
  - Provide list of occupancy factors?
    - Chironomus freshwater insect – lives in water?
    - Are fish species pelagic or benthic?
  - Now that fish weights are confirmed to be wet weight, is there an accepted method to convert to dry weights?