Errata 2011-10

SKB TR-10-09

Biosphere analyses for the safety assessment SR-Site – synthesis and summary of results

In the earlier distributed report, there are errors that have now been corrected. The corrected pages 121 and 139 are enclosed. The changed text is marked with a vertical line in the page margin. An updated pdf version of the report, dated 2011-10, can be found at www.skb.se/publications.

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Table 10-3. Calculated activity concentrations in lake and sea water and in near surface groundwater, resulting from a release of radionuclides given the central corrosion case. Activity consentrations are compared with measured concentrations (median values) from Forsmark and Laxemar and from reference sites available in the literature /Porcelli et al. 2001, Aastrup 1981/.

	Calculated concentrations from a release		Measured background concentrations		
Radionuclide (Bq/l)	Biosphere object 136	Max across all biosphere objects	Forsmark[1)]	Laxemar[2)]	Literature
Lake water					
Ra-226	$8.1 \cdot 10^{-8}$	$2.7 \cdot 10^{-7}$	$6.0 \cdot 10^{-3}$		$4.6 \cdot 10^{-4}$ [3)]
Th-230	$9.7 \cdot 10^{-13}$	$1.1 \cdot 10^{-11}$	$4.2 \cdot 10^{-4}$	$2.2 \cdot 10^{-3}$	
Th-232	$5.8 \cdot 10^{-18}$	$1.1 \cdot 10^{-16}$	$2.0 \cdot 10^{-4}$	$1.4 \cdot 10^{-3}$	$8.2 \cdot 10^{-5}$ [3)]
U-234	$9.1 \cdot 10^{-11}$	$4.0 \cdot 10^{-10}$	$1.7 \cdot 10^{-2}$	$7.3 \cdot 10^{-3}$	
U-235	$6.2 \cdot 10^{-12}$	$2.7 \cdot 10^{-11}$	$6.2 \cdot 10^{-4}$	$3.2 \cdot 10^{-4}$	
U-238	$7.0 \cdot 10^{-11}$	$2.9 \cdot 10^{-10}$	$1.5 \cdot 10^{-2}$	$6.3 \cdot 10^{-3}$	$1.8 \cdot 10^{-3}$ [3)]
Sea water					
Ra-226	$5.7 \cdot 10^{-10}$	$7.2 \cdot 10^{-9}$	$3.1 \cdot 10^{-3}$		$1.1 \cdot 10^{-3}$ [3)]
Th-230	$2.9 \cdot 10^{-17}$	$4.2 \cdot 10^{-15}$	$3.5 \cdot 10^{-4}$	$8.2 \cdot 10^{-4}$	
Th-232	$1.3 \cdot 10^{-22}$	$2.3 \cdot 10^{-20}$	$1.6 \cdot 10^{-4}$	$5.4 \cdot 10^{-4}$	$3.1 \cdot 10^{-6}$ [3)]
U-234	$8.6 \cdot 10^{-14}$	$3.0 \cdot 10^{-12}$	$1.8 \cdot 10^{-2}$	$8.3 \cdot 10^{-3}$	
U-235	$5.4 \cdot 10^{-15}$	$1.9 \cdot 10^{-13}$	$2.9 \cdot 10^{-4}$	$3.0 \cdot 10^{-4}$	
U-238	$6.1 \cdot 10^{-14}$	$2.1 \cdot 10^{-12}$	$1.5 \cdot 10^{-2}$	$6.4 \cdot 10^{-3}$	
Near surface groundwater					
Ra-226	$7.6 \cdot 10^{-6}$	$4.4 \cdot 10^{-4}$	$7.2 \cdot 10^{-2}$	$5.9 \cdot 10^{-2}$	$4.2 \cdot 10^{-3}$ [4)]
Th-230	$1.1 \cdot 10^{-10}$	$1.8 \cdot 10^{-9}$	$1.7 \cdot 10^{-3}$	$4.2 \cdot 10^{-3}$	
Th-232	$6.0 \cdot 10^{-16}$	$1.3 \cdot 10^{-13}$	$9.0 \cdot 10^{-4}$	$2.7 \cdot 10^{-3}$	
U-234	$6.1 \cdot 10^{-9}$	$7.1 \cdot 10^{-8}$	$8.8 \cdot 10^{-2}$	$3.2 \cdot 10^{-2}$	
U-235	$4.2 \cdot 10^{-10}$	$6.9 \cdot 10^{-9}$	$2.5 \cdot 10^{-3}$	$4.7 \cdot 10^{-4}$	
U-238	$4.7 \cdot 10^{-9}$	$7.7 \cdot 10^{-8}$	$7.4 \cdot 10^{-2}$	$2.1 \cdot 10^{-2}$	

[1)] /Tröjbom and Grolander 2010/, [2)] /Roos et al. 2007/, [3)] /Porcelli et al. 2001/, [4)] /Aastrup 1981/

Table 10-4. Calculated activity concentrations in sediments and soil, resulting from a release of radionuclides given the central corrosion case. Activity consentrations are compared with measured concentrations (median values) from Forsmark and Laxemar and from reference sites available in the literature /UNSCEAR 2010/.

	Calculated concentrations from a release		Measured background concentrations		
Radionuclide (Bq/l)	Biosphere object 136	Max across all biosphere objects	Forsmark[1)]	Laxemar[2)]	Literature
Limnic sediment					
Ra-226	$2.9 \cdot 10^{-3}$	$3.8 \cdot 10^{-2}$	$3.6 \cdot 10$	$7.0 \cdot 10$	
Th-230	$9.4 \cdot 10^{-8}$	$2.9 \cdot 10^{-6}$	$2.9 \cdot 10$	$2.8 \cdot 10$	
Th-232	$7.3 \cdot 10^{-12}$	$3.1 \cdot 10^{-11}$	$2.0 \cdot 10$	$2.4 \cdot 10$	
U-234	$7.4 \cdot 10^{-7}$	$2.3 \cdot 10^{-5}$	$1.3 \cdot 10^{2}$	$1.6 \cdot 10^{2}$	
U-235	$7.2 \cdot 10^{-8}$	$1.5 \cdot 10^{-6}$	5.3	6.2	
U-238	$8.1 \cdot 10^{-7}$	$1.6 \cdot 10^{-5}$	$1.1 \cdot 10^{2}$	$1.3 \cdot 10^{2}$	
Marine sediment					
Ra-226	$3.5 \cdot 10^{-4}$	$6.4 \cdot 10^{-4}$	8.5	8.5	
Th-230	$2.1 \cdot 10^{-9}$	$6.8 \cdot 10^{-8}$	5.6	$2.7 \cdot 10$	
Th-232	$1.2 \cdot 10^{-13}$	$3.8 \cdot 10^{-13}$	5.8	$2.6 \cdot 10$	
U-234	$2.2 \cdot 10^{-8}$	$3.4 \cdot 10^{-7}$	8.5	$9.9 \cdot 10$	
U-235	$2.0 \cdot 10^{-9}$	$2.2 \cdot 10^{-8}$	$3.8 \cdot 10^{-1}$	4.0	
U-238	$2.2 \cdot 10^{-8}$	$2.4 \cdot 10^{-7}$	8.0	$8.1 \cdot 10$	
Top soil					
Ra-226	$2.2 \cdot 10^{-3}$	$2.8 \cdot 10^{-3}$	$3.9 \cdot 10$	$1.6 \cdot 10$	2–1000 [3)]
Th-230	$1.8 \cdot 10^{-7}$	$2.4 \cdot 10^{-6}$	$1.7 \cdot 10^{-5}$	5.6	
Th-232	$1.4 \cdot 10^{-11}$	$1.8 \cdot 10^{-11}$	9.6	4.5	0.5–115 [3)]
U-234	$1.3 \cdot 10^{-6}$	$8.6 \cdot 10^{-6}$	$5.1 \cdot 10$	$4.8 \cdot 10$	
U-235	$1.3 \cdot 10^{-7}$	$5.7 \cdot 10^{-7}$	1.8	1.8	
U-238	$1.5 \cdot 10^{-6}$	$6.1 \cdot 10^{-6}$	$4.6 \cdot 10$	$3.4 \cdot 10$	10–1000 [3)]

[1)] /Tröjbom and Grolander 2010/, [2)] /Roos et al. 2007/, [3)] /UNSCEAR 2010/

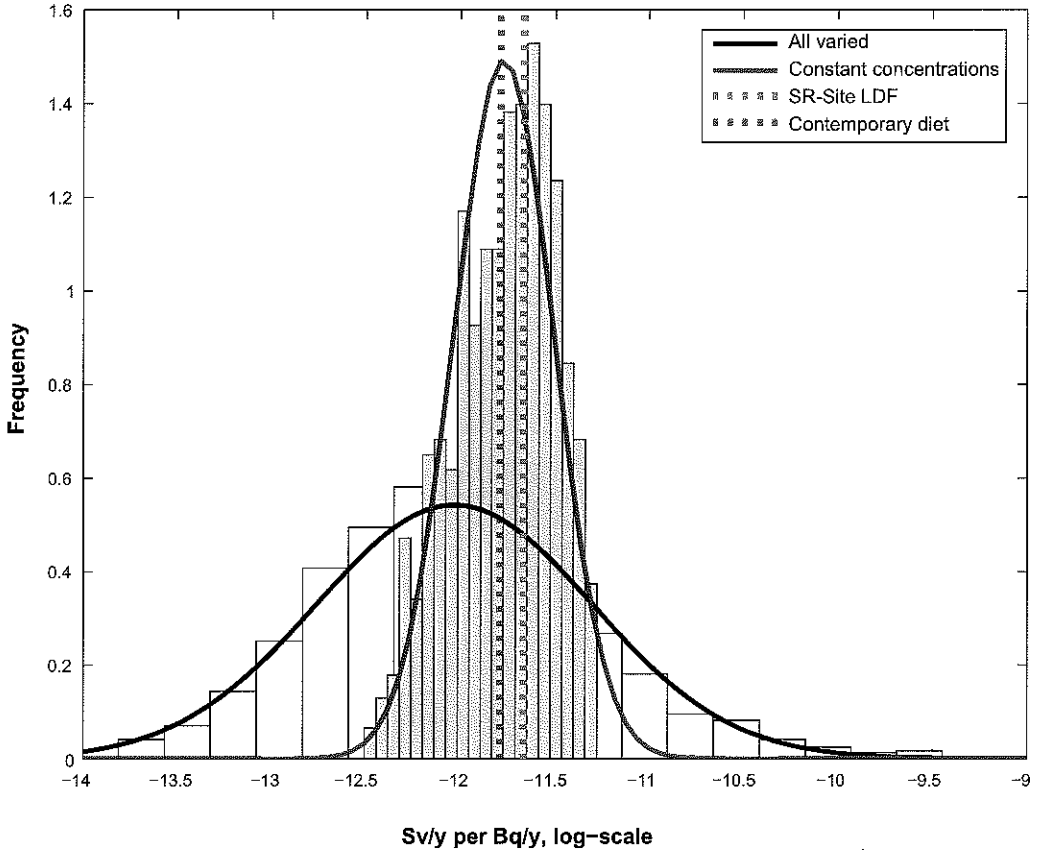

Figure 12-3. Distribution of dose from Ra-226 (and daughter radionuclides) originating from ingestion of contaminted food. Results were obtained from two Monte-Carlo simulations: Red line corresponds to dose distribution resulting from uncertainty in land use and food productivity. Black line corresponds to dose distribution resulting from uncertainty in land use, food productivity and activity concentration in food. The green vertical line shows the dose corresponding to SR-Site LDF. The purple vertical lines shows the value corresponding to a diet based on contemporary food statistics.

Table 12-1. Productivity and potential diet for food items used in the SR-Site assessment. Modern diet was derived from national food statistics /Avila et al. 2010/.

	Production			Diet from food statistic	
	Productivity	Relative			
	(kgC m^{-2} y^{-1})	Without agriculture[a]	With agriculture[a]	(kgFW y^{-1})	Relative
Milk	0.030		7.2%	115[b]	12%
Meat	0.001		0.3%	72	14%
Vegetables	0.135		33%	51	3%
Tuber	0.127		31%	84	14%
Cereal	0.114		28%	71	45%
Fruit				23.5	2%
Fish	$2.7 \cdot 10^{-4}$	47.9%	0.3%	27	4%
Crayfish	$3.1 \cdot 10^{-5}$	5.7%	0.04%	1.7	0.2%
Berries	$1.3 \cdot 10^{-4}$	22.9%	0.03%	4.25	0.4%
Mushrooms	$1.2 \cdot 10^{-4}$	22.0%	0.03%	1.3	0%
Game	$8.3 \cdot 10^{-6}$	1.5%	0.002%	25	5%

[a] equal land and lake area assumed,

[b] unit is litre per year.