Decommissioning of a RADON-type radioactive waste storage facility in Tammiku, Estonia

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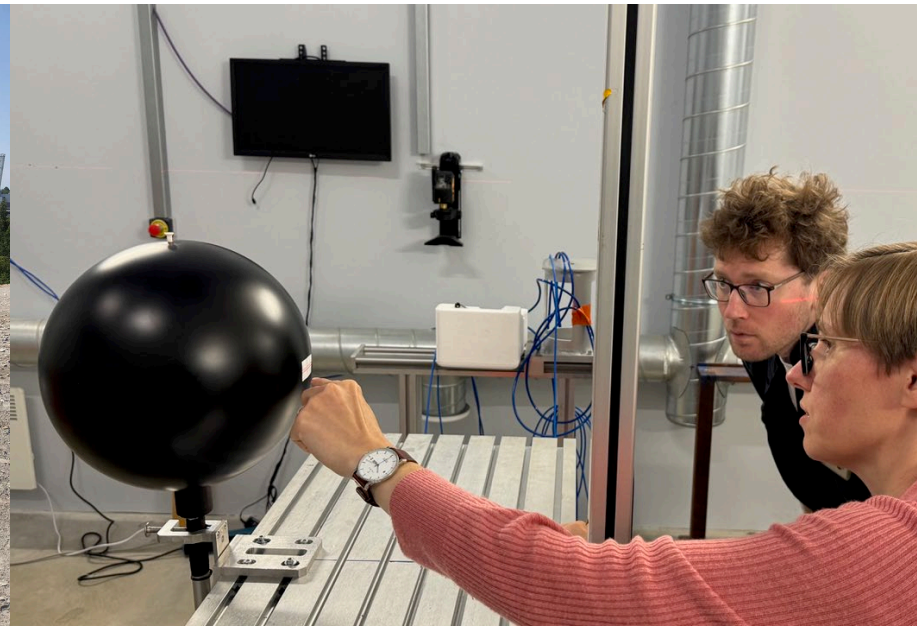


Management of radioactive waste and legacy sites

- the Tammiku site,
- former solvet nuclear submarine training centre in Paldiski

Management of hazardous waste

- Vaivara

Establishment of Dosimetry Calibration Laboratory

- Service available in 2026

Tammiku radioactive waste disposal site

- Located 18 km from Tallinn, Estonia
- RADON-type near-surface concrete vault
- Low- and intermediate-level radioactive waste from medicine, industry and research
- Operated 1963-1995
- Tragic accident in October 1994
  - IAEA, 1998 „The Radiological Accident in Tammiku“
- Managed by ALARA since 1995

Photo: AS ALARA

Decomissioning activities

2001 — Decommis-sioning of liquid waste tank

2002 — Preparatory work for decommissio ning of the solid waste storage facility begins

2004 — Construction of temporary metal cover over the repository

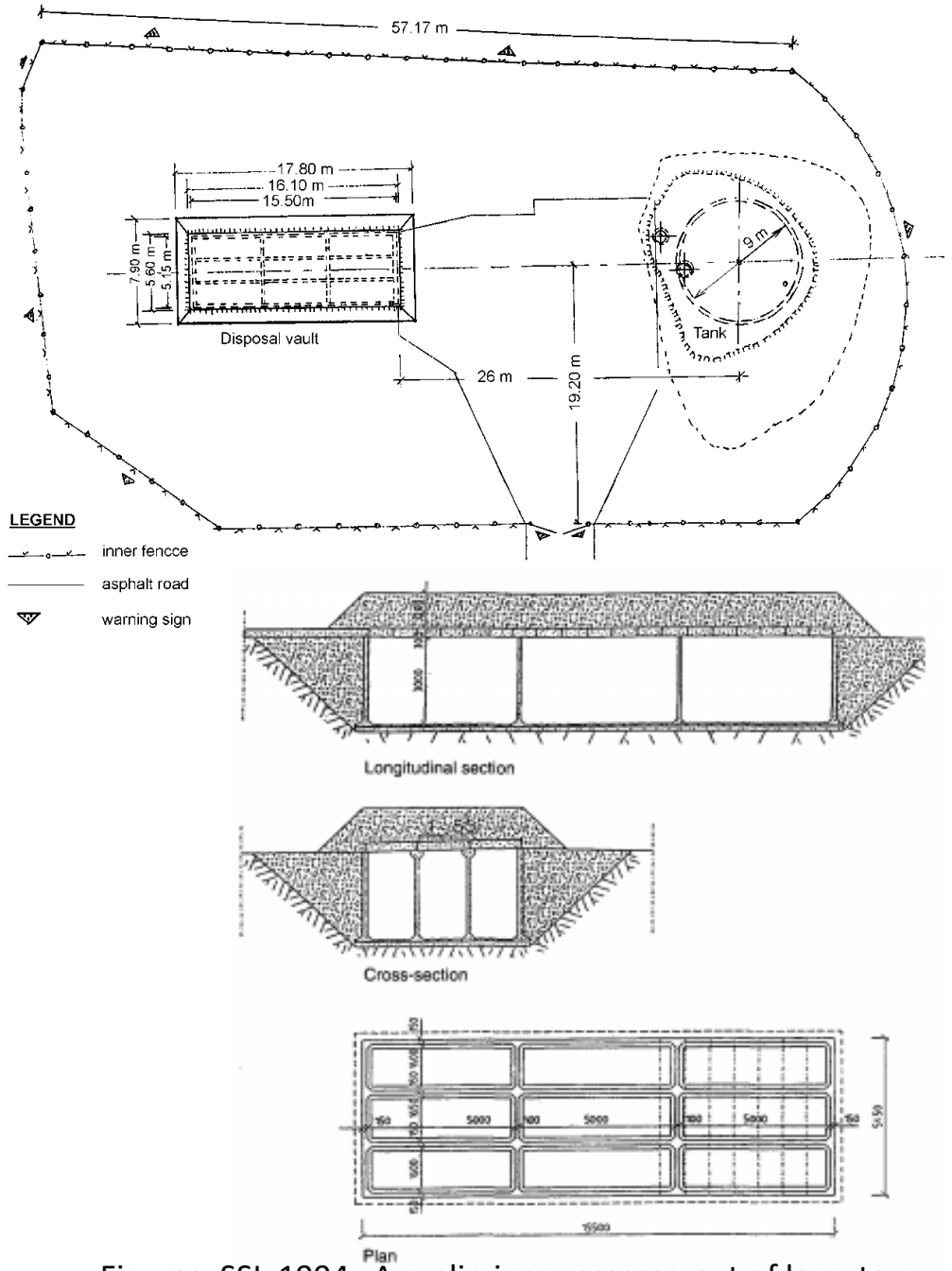
2008–2011 — Removal of radioactive waste

2012–2018 — Decontami-nation of repository structures (walls, floor)

2019 — Demolition of the walls and floor of the repository

2022 — Removal of concrete elements and underlying limestone from the site

2024 — Removal and clearance of asphalt pavement from the site



Figures: SSI, 1994 „A preliminary assessment of long-term radiological safety“

Amount of radioactive waste

- 97 tons of solid radioactive waste
  - Total activity of $7 \cdot 10^{13}$ Bq
- Concrete floor of the repository 7 tons
- Limestone layer from underneath the repostory 55 tons
  - Waiting for clearance
- Concrete walls and cover blocksof the repository 127 tons
  - Waiting for clearance

Photos: AS ALARA

Tammiku site today

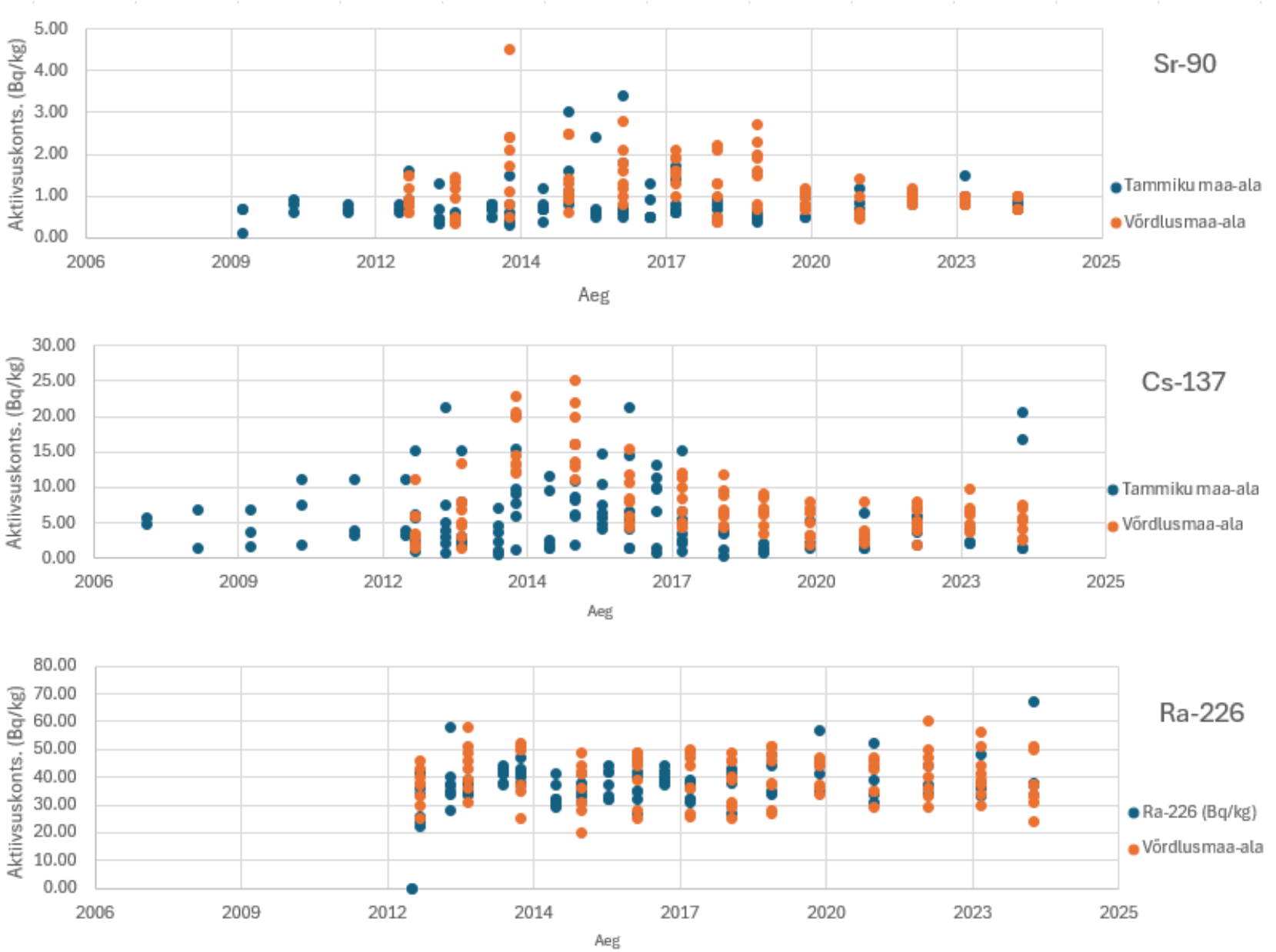
End goal: unconditional clearance from regulatory control

Environmental monitoring on Tammiku site

- Soil - Cs-137, Sr-90, Ra-226, Am-241
- Gras - Cs-137, Sr-90
- Water - H-3, Cs-137, Sr-90, Ra-226, Am-241

On reference site

- Soil - Cs-137, Sr-90, Ra-226, Am-241



Environmental monitoring results: soil samples from Tammiku site and from the reference site.

Radionuclides of interest

- Initial list of potential radionuclides
  - SKB, 2005 “TAMMIKU - Retrieval and Conditioning of RMI waste”

Sr-90, C-14, Co-60, Cs-137, Ra-226, Pu-239, H-3, Am-241, Eu-152, Eu-154, Ni-63, Kr-85

- **Nuclides considered in final dose assessment of Tammiku area**

Ra-226, Cs-137, Sr-90, C-14, Am-241

Photos: AS ALARA

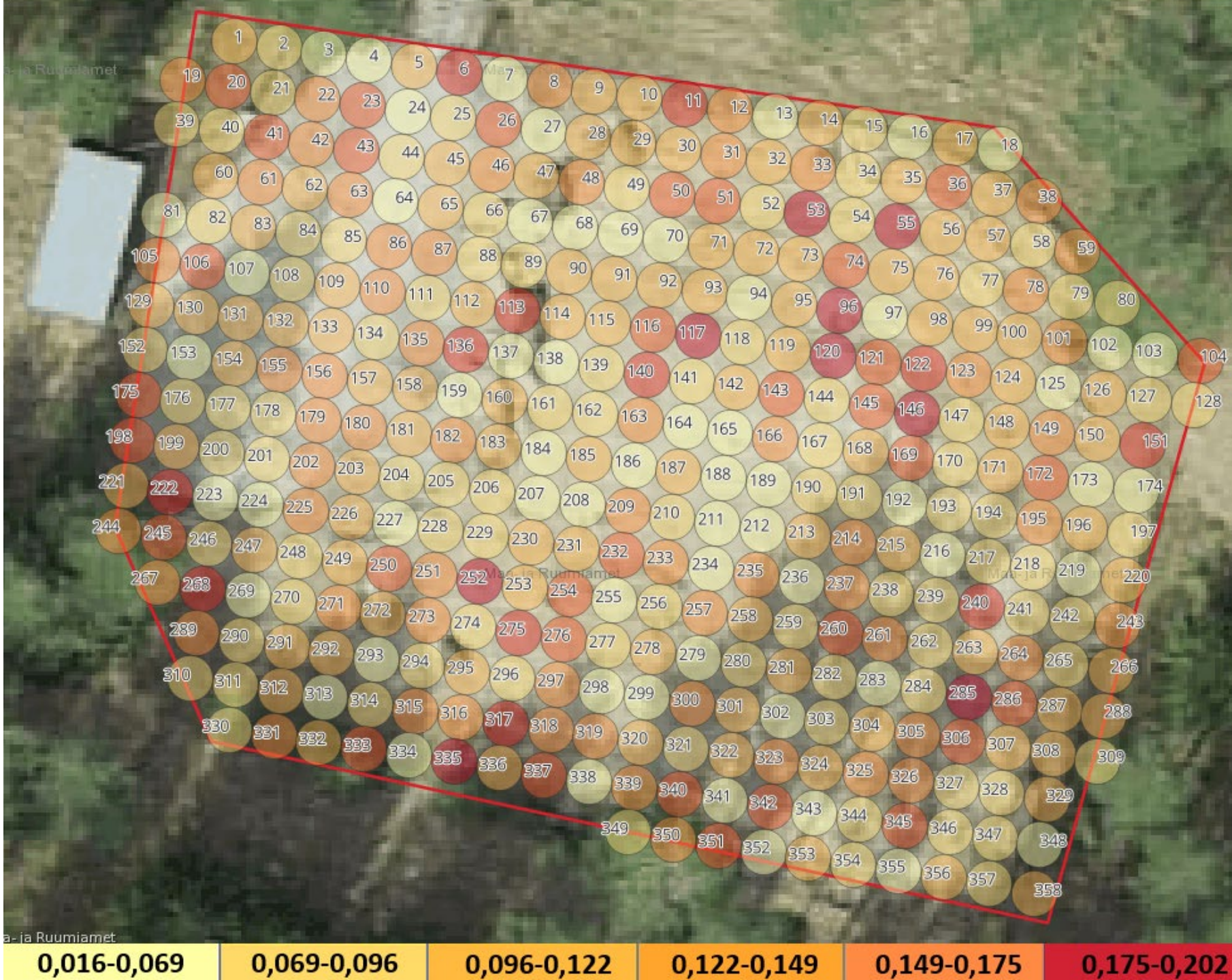
Final measurements for clearance of the site

Dose rate mapping

- 0.12 hectars measured with Automess 6150 AD 6/H.
  - Highest dose rate 0.202 µSv/h

Soil sampling

- Soil samples taken from locations with highest dose rates.
- C-14 and Sr-90 samples taken from potentially most contaminated areas.



Dose assessment for site clearance

- Comparison of annual effective dose for general public on the Tammiku site and on the reference site.
- Dose constraint **10 µSv/year** as given in the radiation practice license
- RESRAD-ONSITE
- Farmer scenario
- 10 000 year simulations
- Input values: recent monitoring data + final measurement results (Ra-226, Cs-137, Sr-90, C-14, Am-241 in soil samples).

Results of the dose assessment

- Most important dose contributor Ra-226
- Radionuclides detectable on the Tammiku site do not cause a significant additional dose.

	Reference site		Tammiku site		Difference* (mSv/a)
Max annual effective dose	0,57	mSv/a	0,47	mSv/a	-0,10
When the max dose occurs?	42,42	a	33,22	a	
Contribution by radionuclide	mSv/a	fraction of the total dose	mSv/a	fraction of the total dose	
Am-241	3,41E-05	0,0001	2,59E-05	0,0001	-8,14E-06
C-14	0,00E+00	0,0000	6,93E-33	0,0000	6,93E-33
Cs-137	9,75E-04	0,0017	1,71E-03	0,0036	7,36E-04
Ra-226	5,71E-01	0,9977	4,64E-01	0,9790	-1,07E-01
Sr-90	3,20E-04	0,0006	8,24E-03	0,0174	7,92E-03

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Thank you!

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