

Challenges in Characterization of Legacy Alpha-Emitting Radionuclides in a Norwegian River and Wetland.

Anna Banel^{1,*} and Marte Holmstrand¹

¹*Institute for Energy Technology, 2007 Kjeller, Norway*

* e-mail: anna.banel@ife.no

Legacy discharges of long-lived alpha-emitting radionuclides from the Norwegian research reactor JEEP, operated by the Institute for Energy Technology (IFE) since the 1950s, have led to contamination of nearby wetland and river systems (Sogna and Nitelva). Between 1963 and 1967, several megabecquerels of alpha emitters were released to a wetland area, after which discharges were redirected to the river. Although these discharges ceased decades ago, environmental conditions and landscape changes over time have influenced the distribution and potential mobility of the contaminants.

This work presents the planning and scope of an ongoing characterization project aimed at mapping the extent and nature of the contamination. The approach integrates historical data, environmental sampling, and geostatistical tools to support reliable risk evaluations. Special attention is given to understanding factors affecting radionuclide mobility and bioavailability, particularly for plutonium. The sampling campaign also faces logistical and safety challenges, including sediment coring in rivers and wetlands, and the risk of encountering unexploded ordnance from World War II.

Long time intervals since the release, combined with erosion, sedimentation, and human interventions, make interpretation of contaminant pathways highly uncertain. Selecting representative sampling locations across a large and heterogeneous area is critical to avoid under- or overestimation of risk. This comprehensive planning framework provides a template for thorough characterization of legacy radioactive contamination in complex environments, delivering reliable data for environmental risk assessment and potential remediation planning in line with national regulations.