Title	Assessing the impact of releases of radionulides into sewage systems in urban environemnt - simulation, modelling and experimental studies – LUCIA
Author(s)	Synnöve Sundelll-Bergman[1)], Rodolfo Avila[2)], Idalmis de la Cruz[2)], Shulan Xu[3)], Marketta Puhakainen[4)], Tarja Heikkinene[4)], Tua Rahola[4)], Ali Hosseini[5)], Sven Nielsen[6)] and Magnus Sigurgeirsson[7)]
Affiliation(s)	[1)]Vattenfall Power Consultant, Sweden [2)]Facilia AB, Sweden [3)]Swedish Radiation Safety Authority, Sweden [4)]STUK, Finland [5)]Norwegian Radiation Protection Authority, Norway [6)]Risø National Laboratory for Sustainable Energy, DTU, Denmark [7)]Geislavarnir rikisins, Iceland
ISBN	978-87-7893-259-4
Date	June 2009
Project	NKS-B / LUCIA
No. of pages	78
No. of tables	40
No. of illustrations	38
No. of references	21

Abstract

This report summarises the findings of a project on assessing the impact of releases of radionuclides into sewage systems and was established to provide more knowledge and suitable tools for emergency preparedness purposes in urban areas. It was known that the design of sewage plants, and their wastewater treatments, is rather similar between the Nordic countries. One sewage plant in each of the five Nordic countries was selected for assessing the impact of radionuclide releases from hospitals into their sewerage systems. Measurements and model predictions of dose assessments to different potentially exposed members of the public were carried out. The results from the dose assessments indicate that in case of routine releases annual doses to the three hypothetical groups of individuals are most likely insignificant. Estimated doses for workers are below 10 µSv/y, for the two studied radionuclides 99mTc and 131I. If uncertainties in the predictions of activity concentrations in sludge are considered, then the probability of obtaining doses above 10 µSv/y may not be insignificant. The models and approaches developed can also be applied in case of accidental releases.

A laboratory inter-comparison exercise was also organised to compare analytical results across the laboratories participating in the project, using both 131I, dominating man-made radionuclide in sewage systems due to the medical use.

A process oriented model of the biological treatment is also proposed in the report that does not require as much input data as for the LUCIA model. This model is a combination of a simplified well known Activated Sludge Model No.1 (Henze, 1987) and the Kd concept used in the LUCIA model. The simplified model is able to estimate the concentrations and the retention time of the sludge in different parts of the treatment plant, which in turn, can be used as a tool for the dose assessment purpose.filled by the activity.

Key words risk assessment, sewage sludge, radioactive iodine, Tc-99m, dose modelling

Available on request from the NKS Secretariat, P.O.Box 49, DK-4000 Roskilde, Denmark.
Phone (+45) 4677 4045, fax (+45) 4677 4046, e-mail nks@nks.org, www.nks.org