

RADON IN DRINKING WATER

Implications of the European Council Directive 2013/51/Euratom

INTRODUCTION

Water bottlers and soft drink manufacturers are no doubt already aware of the Euratom Drinking Water Directive (2013/51/Euratom) that requires monitoring of radioactive substances such as radon, tritium and “indicative dose” in drinking water. Tritium and “indicative dose” requirements have already been partly transposed into UK legislation. Radon requirements have been transposed into the relevant drinking water regulations in Scotland, Wales and Northern Ireland since late 2015. England is expected to legislate the Directive’s radon in drinking water requirements in early 2016.

The Directive introduces:

- A radon indicator value of 100 Bq/l within drinking water, above which there is a requirement to assess the risk to human health
- The use of data surveys to understand the likely exposure to radon in drinking water supplies
- The requirement for monitoring where radon concentrations are likely to exceed the indicator value

WHAT THIS MEANS FOR WATER BOTTLERS AND SOFT DRINK MANUFACTURERS

Water bottlers and soft drink manufacturers will need to assess whether their water supply used for human consumption is at risk from radon, with the exception of Natural Mineral Water. Where a risk is established, monitoring will need to be carried out at set sampling frequencies and to prescribed limits of detection for radon analysis.

WHAT IS RADON AND HOW COULD IT ENTER A DRINKING WATER SOURCE?

Radon (Rn 222) is a naturally occurring radioactive colourless and odourless gas with a short half life of 3.8 days. It is produced from the radioactive decay of naturally occurring radioactive metals (Uranium – 238 and Radium – 226) which are present in all rocks and soils. The amount of radioactive metals within the underlying geology will contribute to radon gas levels.

Radon gas dissolves readily in water which means that groundwater passing through a rock with a significant radon concentration can pick up radon and transport it. In this case, whether or not radon is present in a drinking water source will be dependent on the velocity at which groundwater flows and how far the radon can be transmitted. If the groundwater flow rate is slow then radon may decay before the water reaches a spring or source borehole. On the other hand, groundwater may be abstracted before decay reduces radon concentrations to insignificant levels.

Surface waters that contain a groundwater component are unlikely to transport significant radon concentrations as any radon dissolved in the surface water will quickly degas to the atmosphere. Therefore radon exposure from water supplied from lakes, reservoirs or rivers is likely to be minimal.

HOW TO DETERMINE WHETHER A DRINKING WATER SOURCE IS AT RISK

A screen, test, evaluate approach is recommended.

Screening Radon Hazard

An initial indication of the hazard of radon in groundwater supplying drinking water sources can be found on the UK reference site on radon from Public Health England (<http://www.ukradon.org/information/ukmaps>). The free UK map shows the worst case of radon risk based on a 1 km grid square.

Testing & Analysis

If the screening demonstrates that the indicator values might be exceeded at the source, a water sample should be taken and analysed for radon. If the analysis results indicate that radon activity exceeds 100Bq/l, then

monitoring must continue at the sampling frequencies required by the devolved administrations, which are dependent on production volume.

Radon sampling and testing must be carried out carefully and quickly to ensure that a representative analysis is obtained. With a half-life of only 3.8 days the radon activity will decrease rapidly.

Liaison with your chosen laboratory is critical. GAU Radioanalytical Laboratories (University of Southampton) (<http://www.gau.org.uk/>) provide a UK based analytical service. Other laboratories may offer a similar service.

There is an exemption from monitoring radon if a representative survey, monitoring data or other reliable information shows that radon concentrations will remain below the 100Bq/l indicator value.

Evaluate

If radon activity is less than 100Bq/l then understanding the source of radon and demonstrating that it will remain below 100Bq/l can mean that monitoring is not required. A representative geological desk based survey based on reliable information would collate the following, based on published maps and data:

- Local and regional geology and rock types at outcrop and depth
- Review of relevant published geological maps
- Review of relevant published geological and borehole records
- Radioactivity of local rock or soil based on published information for similar rock types
- Review of the geology encountered by source boreholes based on as built construction records and geophysical logging

If the geological desk survey demonstrates that rock types are present that might contribute radon, then it should be supplemented with a hydrogeological desk study to establish whether the source water is likely to have been in contact with the radon source rock.

The hydrogeological desk study would include the following:

- Aquifer properties such as the rock's ability to transmit groundwater and the rate of groundwater flow through pores or fractures
- Catchment groundwater elevations to identify the groundwater flow direction
- Pathways connecting the radon bearing rocks with the source aquifer

If the radon activity is greater than 100Bq/l and considered high risk, options to reduce risk to human health will be required, such as degassing and storage.

SUMMARY

- You need to assess your sources for radon risk
- Keep it simple and use the free UK reference site on radon from Public Health England first
- If you need to sample and analyse speak with the laboratory and make a plan
- If you need to go further use simple desk studies

REFERENCES

Ricardo – AEA: Understanding the implications of the EC's Proposals Relating to Radon in Drinking Water for the UK: Final Report. 24/03/2015

UK reference site on radon from Public Health England: www.ukradon.org

WE ARE HERE TO HELP

Envireau Knowledge is our website's information base, where you can find articles, presentations and technical bulletins relating to the ever changing world of water management and environmental issues.

Registration takes just a few seconds and it is your opportunity to keep up to date and learn more about the latest industry developments for free.

Visit our website for more information:

www.envireauwater.co.uk/knowledge-exchange

Bulletin provided for guidance only. Expert advice should be obtained before acting on guidance.

