

Map Showing Potential for Radon in Indoor Air in Nova Scotia

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Introduction

The Province of Nova Scotia, acting on a recommendation from Health Canada in June 2007, lowered its guideline for radon in air within dwellings to 200 Bq/m³ from the previous level of 800 Bq/m³. In response to the lowering of the Health Canada radon guideline, the province embarked on a comprehensive five-year program of surveying radon levels within all government-owned and -operated facilities. This includes, but is not limited to, schools, hospitals, government offices, long-term care facilities and public housing. Testing began in the winter of 2007-2008 and upon conclusion in 2011, will consist of many thousands of radon determinations. Testing is being carried out according to the Health Canada radon testing protocol "Guide for Radon Measurements in Public Buildings". Following testing, remediation of sites found to exceed the Health Canada guideline will also be carried out according to the Health Canada protocol.

The Nova Scotia Department of Health Promotion and Protection recommends that all homeowners in the province test their homes for radon. This across-the-board recommendation is being made since radon studies carried out globally have shown that although the percentage of homes exceeding the guideline can vary between areas, there are never areas completely devoid of homes that exceed the guideline. It is known, however, that there are some regions in which the percentage of exceedences is higher. As a result, a map of the province showing regions where there is a higher likelihood of having homes in exceedence would be useful. As part of the Geological Services Division's Environmental Geology Program a project was initiated in 2008 to produce such a map (Fig. 1). This report describes progress on this project during 2008.

The Radon in Indoor Air Problem

Radon is a naturally occurring, colourless and odourless gas that is radioactive and is found in all rocks and soils. The natural formation of radon is related to the U²³⁸ decay series: as a parent U molecule decays to non-radioactive Pb²⁰⁶, it does so by passing through roughly 14 separate isotopic stages of decay. Each stage of radioactive decay produces a separate daughter radioisotope and radon is one of these. Radon is a gas, unlike the parent U²³⁸ and all of the other radioactive daughter elements; therefore, it is much more easily transported in air and water.

Radon is known to produce lung cancer. In fact, it is the second leading cause of lung cancer after smoking and is the leading cause of lung cancer among non-smokers. All rocks and soils throughout the province have at least some amount of uranium and, therefore, also have some amount of radon. Since radon is a gas, it can be transported along fractures in rock and through pore spaces in soil to reach the foundations of buildings, where it can enter through openings such as cracks, vents and open sumps. Radon is a heavy gas and once in the home, it generally concentrates in low-lying areas, most commonly the basement or lowest levels of the home. Radon can sometimes reach very high levels, and can actually be orders of magnitude above the 200 Bq/m³ Health Canada guideline. In the outdoor environment, the natural dilution of radon emanating from the earth into the atmosphere is very strong and within short order the radon level in the air is reduced to very low background amounts. Within the enclosed spaces of homes and buildings, however, this dilution does not always take place and often the radon gas is concentrated. Homeowners should take steps to minimize their exposure to radon in indoor air

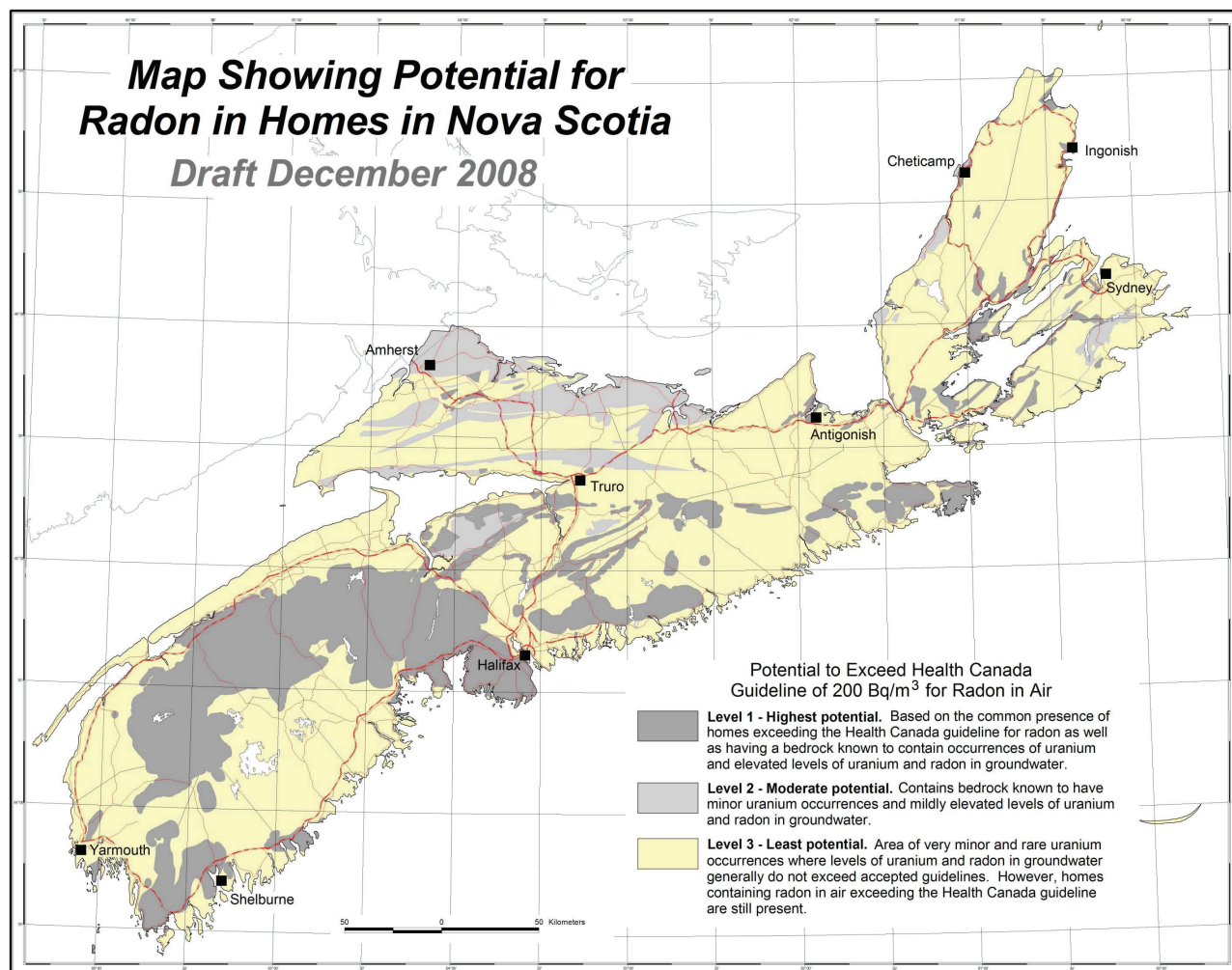


Figure 1. Preliminary map showing potential for radon in air within homes in Nova Scotia.

because of the known association between radon exposure and lung cancer.

Previous Radon Surveys in Nova Scotia

Surveys of radon levels in air within Nova Scotian homes is limited to a few reconnaissance surveys. None of these could be considered a comprehensive survey of all regions of the province. The federal government carried out a survey of radon in 10,000 homes (14 cities) nationwide between 1978 and 1979. Of these, 881 were in Halifax and 9% were found to exceed 150 Bq/m³; none exceeded the 800 Bq/m³ Health Canada guideline that was in place at that time.

Unfortunately, the results of this survey are unpublished and only summaries of the information are known. ATV News carried out a cursory survey of short-term radon levels in 105 homes from 14 communities around the province in 1988. The results showed seven homes in the Timberlea area, outside Halifax, exceeded the 800 Bq/m³ guideline (guideline in 1988). Follow-up testing of 33 homes in Timberlea showed 19 exceeded 800 Bq/m³, with the average being 1,400 Bq/m³ and the highest being 7,200 Bq/m³.

The Nova Scotia Department of Health carried out short-term radon testing in 719 homes throughout several regions of the province in 1989 (Jackson, 1990, 1992). This testing was restricted to regions with known uranium occurrences or where the limited previous radon surveys indicated

homes with known radon exceedences. Twelve percent of the homes tested exceeded 150 Bq/m^3 and 3% exceeded 800 Bq/m^3 . The mean was 112 Bq/m^3 and the maximum level was recorded in a home in Cheticamp ($6,000 \text{ Bq/m}^3$). The Jackson (1990 and 1992) survey showed that radon exceedences were found in all areas tested, but that some areas are more prone to the problem, such as Cheticamp-Grand Etang, Ingonish-Ingonish Beach, Timberlea-Lakeside and Three Mile Plains. The Nova Scotia Department of Health, subsequent to the Jackson (1990) survey, produced a map of potential for radon in Nova Scotia (Nova Scotia Department of Health, 1990). This map was preliminary in nature and portrays little more than areas of the province with the highest background radioactivity, as indicated by the federal government's airborne radiometric surveys over the province carried out between 1976 and 1985. Jackson (1992), however, showed that there is an interesting positive correlation between communities with a higher percentage of radon exceedences and areas of higher background radiation as indicated from the federal government airborne radiometric surveys.

Radon Map of Nova Scotia

A preliminary version of the map showing relative potential for radon in homes in Nova Scotia was compiled by the Department of Natural Resources in 2005 (Fig. 1). This map drew on data from several sources: (1) results from previous surveys of radon in homes; (2) federal government airborne

radiometric surveys carried out province-wide between 1976 and 1985; (3) surveys carried out by uranium exploration companies between 1975 and 1981; and (4) knowledge of the geological terrains of the province where uranium has been known to be mobilized through natural geological processes. The initiation of province-wide radon surveys in of all governmental-owned and -operated facilities in 2007 proved to be an excellent opportunity for new data to update the preliminary radon map and produce a publishable version of the map. In 2009, two years' worth of new radon data from the government surveys will be available for this purpose. These data will be incorporated on the preliminary map and a final version will be published and released late in 2009.

References

- Jackson, S. A. 1990: A survey to measure domestic concentrations of radon gas in Nova Scotia, Part 1, Screening Survey; Nova Scotia Department of Health, unpublished report, 30 p.
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