

A HOT SPOT SURVEY IN THE READING PRONG AREA OF PENNSYLVANIA

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In an effort to increase radon testing, particularly in areas suspected of having high indoor radon potential, a series of hot-spot surveys will be conducted by the Bureau of Radiation Protection's Radon Division. This effort will include free radon testing to selected homeowners in a defined hot-spot survey area and an increased newspaper campaign.

A hot-spot is determined after a home is confirmed to have a radon level of 100 picocuries per liter (pCi/l) or greater. It is around this "index" home that the hot-spot survey is set up. Two primary factors determine the size and shape of the hot-spot survey area; geologic factors and easily defined boundaries such as roads or township borders. A third factor that must also be considered is the number of homes in the area. This number must be manageable by the Radon Division staff. After the survey area has been defined, Radon Division staff will meet with the township officials to discuss the willingness of the local officials to permit the survey and then to obtain the names of all homeowners in the particular area.

This hot-spot survey consisted of the entire borough of St. Lawrence, south of Route 562 and part of Exeter Township in the 19606 zip code, in Reading, PA. The area in Exeter Township formed a triangle with Route 422 as the southwest border, the St. Lawrence Borough as the northeast border and 37th Street as the base of the triangle towards the southeast (see Appendix A). The index house for this survey was a home in the St. Lawrence Borough with a radon level of 1,800 pCi/l.

The geology of this area (see Appendix B) is made up of the Hardyston Formation, which is a fine to medium grained quartzite and feldspathic sandstone and an undifferentiated Cambrian carbonate. The Hardyston Formation is of particular interest. There are six city block size hills of this material in our study area. There was originally a mile-sized mass of brittle quartzite that was physically emplaced along a nearly horizontal fault in this area. Continuing erosion reduced this mass to the city block size hills that are now present. Because these hills represent pieces of the base of the original hill and are in the plane of the former fault movement, they are likely to be extremely brecciated and highly permeable to soil gas (MacLachlan, 1992).

Due to the faulting and the highly permeable soil, there is a possibility that Radon-220, arising from Thorium-232, could also be contributing to indoor gas exposures. This possibility was not investigated during this study.

Based on the names received from the local officials, 590 certificates (see Appendix C) for a free radon test were mailed to the residents. St. Lawrence residents were mailed 369 certificates and Exeter Township residents were mailed 221 certificates. From the 590 residents who received a certificate, 222 residents returned the certificates for a free radon test. Of those 222 residents, 174 followed through to have their homes tested.

Actual radon testing consisted of two types of tests. A short-term grab scintillation cell was used by Bureau staff to sample 26 homes during July and August 1995, with a 2 day charcoal canister used as a follow-up during the fall. The other testing option consisted of sending the homeowner just the two-day charcoal canister from a contracted lab. This testing took place from July to November 1995. Additionally, duplicate Radon-222 in water samples were taken, one in Exeter Township and one in St. Lawrence Borough.

Radon Test Results for the St. Lawrence Borough/Exeter Township Hot Spot Survey

pCi/l :	<4	4 - 10	11 - 20	21 - 50	51 - 100	>100
N :	60	43	26	25	11	7
% :	34.4	24.7	15.5	14.3	6.3	4.2

N = Number of homes tested.

Based on this limited sample size of 174 homes, it can be seen that 65.0% of the sampled homes had radon levels above the EPA guideline of 4.0 pCi/l. The radon levels ranged from 0.2 to 360 pCi/l. It should also be kept in mind that much of this sampling was performed during the late summer and early fall months when radon levels tend to be lower than the winter months (Cohen and Gromicko, 1988). However, wintertime radon levels do not always prove to be higher than summertime readings (NCRP, 1984).

The two public water supplies tested were Glen Alsace and Mt. Penn, with results of 150 and 343 pCi/l respectively. The EPA-proposed maximum contaminate level for Radon-222 in public water supplies may be in the range of 300-3,000 pCi/l. Neither of the two tested water supplies would contribute any significant radon to the indoor radon levels and the risk from ingestion at these levels would be very small.

The above data would certainly confirm that this hot-spot survey was highly useful in providing homeowners with valuable radon test results and increasing the level of awareness for those homeowners who did not test. As a matter of fact, the Bureau of Radiation Protection has actively campaigned in this area over the past ten years to try and increase the public awareness regarding the health hazard from radon gas. This campaign has been via public speaking, newspaper, radio, and television.

Special thanks to Robert Smith, Chief of Mineral Resources, Department of Conservation and Natural Resources for his information on the geology of the survey area.

REFERENCES

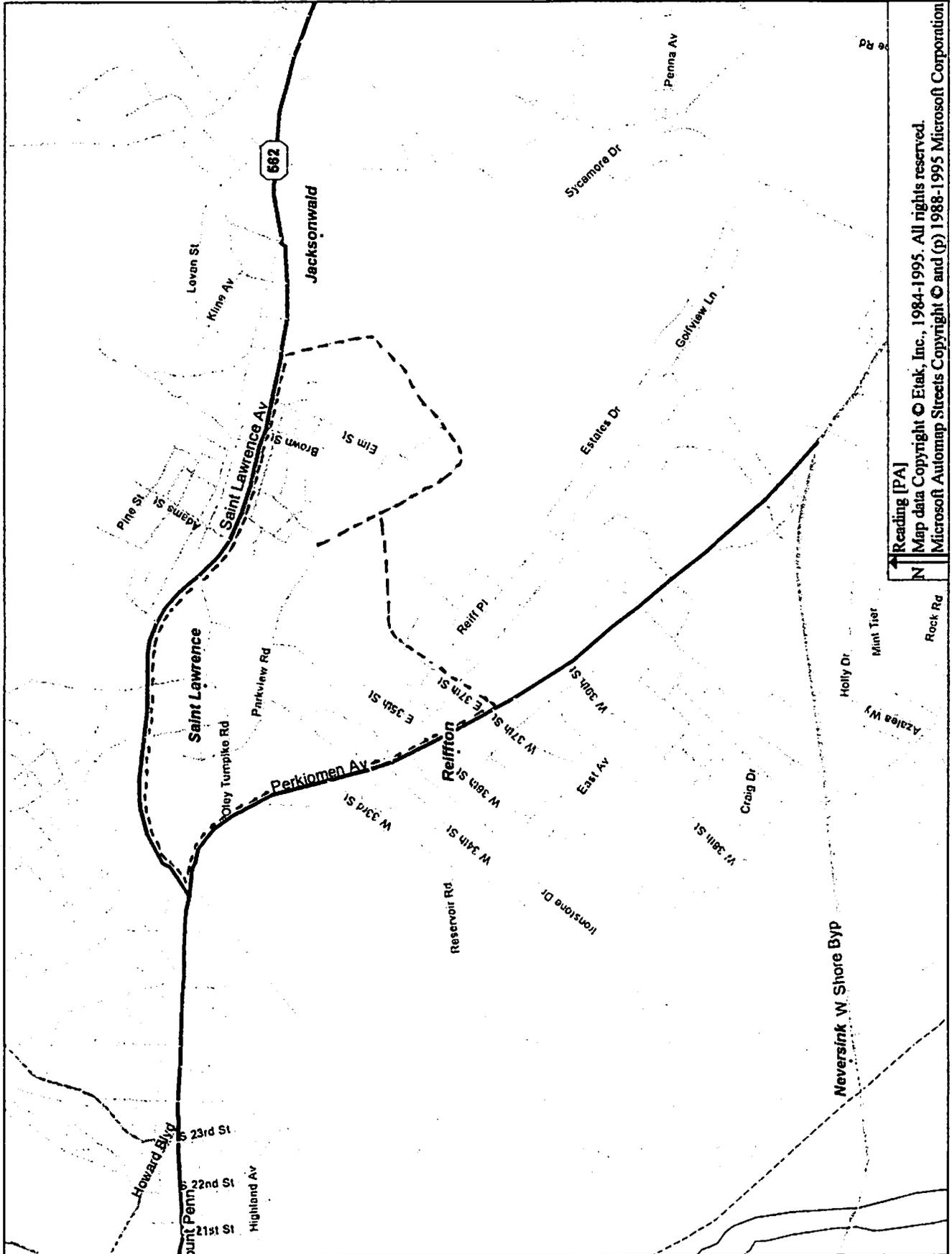
- Cohen, B and Gromicko, N. Variation of Radon levels in U.S. Homes with Various Factors. JAPCA, Volume 38, No. 2. February 1988.
- MacLachlan, D.B. Geology and Mineral Resources of Reading and Birdsboro Quadrangles Berks, County, Pennsylvania. 1992. Pennsylvania Geological Survey Atlas 187 cd.
- NCRP Report No. 77, Exposures From the Uranium Series With Emphasis on Radon and its Daughters. 1984.

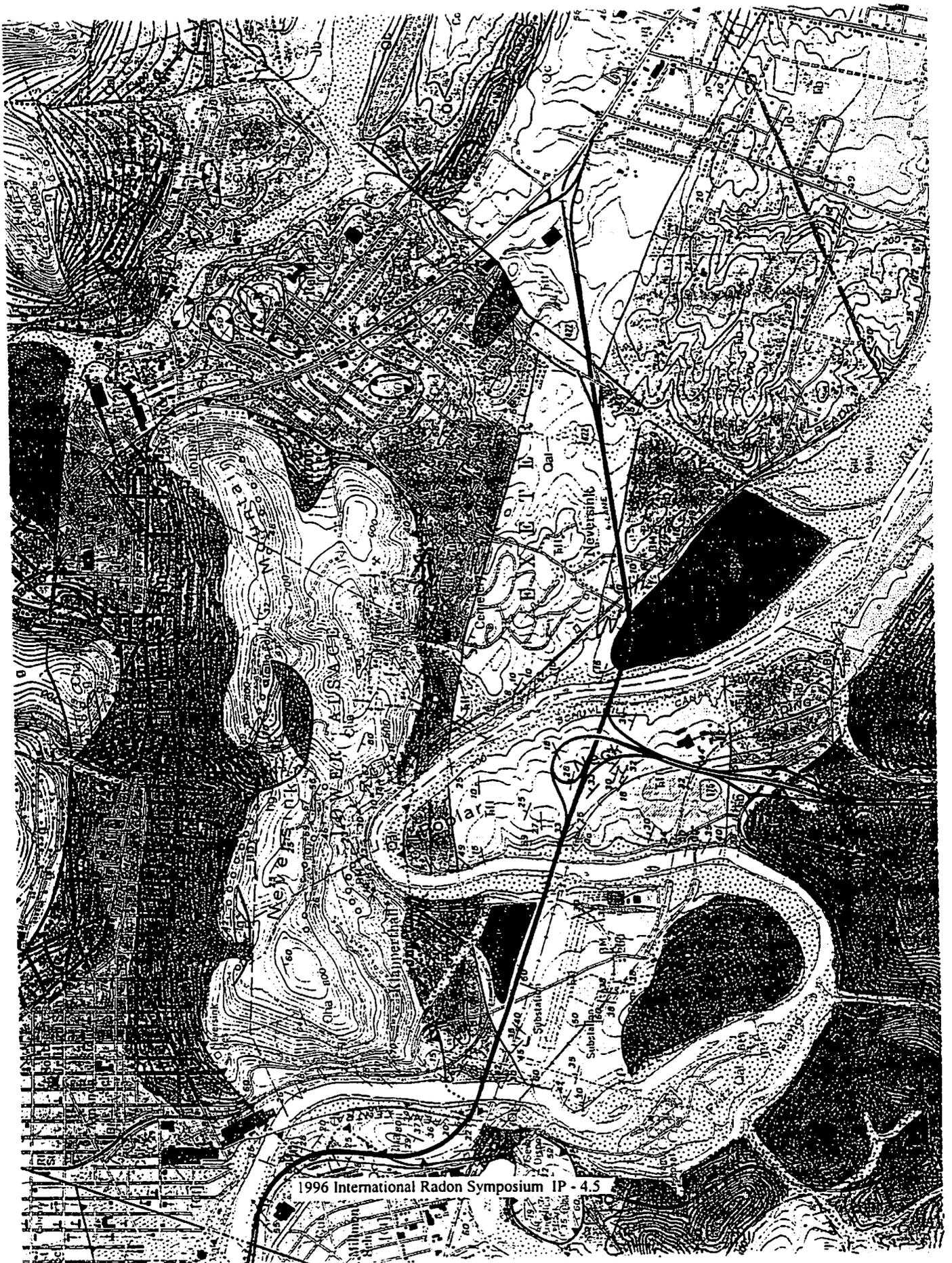
Index to Map Abbreviations

Cul - Undifferentiated Cambrian Carbonates

Cha - Typically light-gray, ranging from nearly white to dark-gray, light-buff, and reddish-gray, fine- to medium-grained quartzite and feldspathic sandstone in 15- to 50-cm (6- to 20-in.) beds. Usually massive with fairly wide spaced, blocky jointing, but may have thin laminations or crossbedding. Skolithos present in upper part. A quartz-pebble conglomerate, 8 m (25 ft) thick, containing coarse feldspathic sandstone in a minor dark-gray argillaceous matrix, occurs at the base and is shown by a circle pattern; it is transitional upward through about 15 to 30 m (50 to 100 ft) of conglomeratic, feldspathic quartzite to typical Hardyston.

APPENDIX A





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CERTIFICATE FOR FREE RADON TEST SPECIAL RADON SURVEY PROGRAM

RETURN THIS CERTIFICATE TO RECEIVE, FREE OF CHARGE, A RADON TEST.
(LABORATORY ANALYSIS INCLUDED)

THE TEST IS EASY TO PERFORM, AND THE RESULTS WILL BE MAILED DIRECTLY TO YOU.

FOR YOUR FREE RADON TEST, FILL OUT THE FOLLOWING INFORMATION, CHECK THE OPTION
YOU WANT, AND MAIL THE CERTIFICATE IN THE ENCLOSED ENVELOPE.

NAME: _____

ADDRESS: _____
STREET

CITY STATE ZIP

PHONE NUMBER: _____

COUNTY: _____ BORO OR TWP: _____

CHECK ONE OF THE OPTIONS BELOW:

- OPTION 1: A FREE TWO-DAY CHARCOAL TEST KIT MAILED TO YOU IMMEDIATELY. This option requires you to keep the house closed up 12 hours prior to deploying the test kit, and for the 48 hours that the kit must remain in the house.
- OPTION 2: A FREE TWO-DAY CHARCOAL TEST KIT MAILED TO YOU IN OCTOBER, when the outside temperature becomes cooler and it is easier to keep the house closed up. This option still requires that the house be closed up for 12 hours prior to deploying the test kit, and for the 48 hours the kit must remain in the house.
- OPTION 3: A FREE VISIT BY A BUREAU STAFF MEMBER AS SOON AS THE VISIT CAN BE SCHEDULED, TO TAKE A GRAB SAMPLE. This grab sample will give you a quick indication of the radon level in your home. The grab sample may be scheduled for a time between 10:00 a.m. and 3:00 p.m., Monday thru Friday. The grab sample test requires you to keep the house closed up 12 hours prior to the visit. A follow-up test after the grab sample is recommended to confirm the grab sample result.

RETURN THIS CERTIFICATE TO:
Department of Environmental Resources
Bureau of Radiation Protection
P.O. Box 8469
Harrisburg, PA 17105-8469

MUST BE RETURNED BY: AUGUST 15, 1995

SERIAL #: _____