

**THE NEW JERSEY RADON OUTREACH PROGRAM**

Karen Tuccillo, Elaine Makatura, William Hoyle  
New Jersey Department of Environmental Protection  
CN411, Trenton, New Jersey 08625

**ABSTRACT**

Public communication or community outreach affects the reactions to, and perceptions of radon risk, and, in turn, impacts on the decision to test and/or remediate. As a result, the state implemented (through legislation) a public information campaign to motivate the populus to conduct initial radon screening. This was done by informing residents through the installation of a toll free information line, and mailing out informational packages; by developing an infrastructure with local health officers to assist the department; and by creating a slide presentation to ensure a consistent message is given to all residents. This paper will address the various components, successes and variables involved in New Jersey's radon outreach program and the impact each has had on the total radon program in New Jersey.

## INTRODUCTION

Radon is a naturally occurring, chemically inert, radioactive gas. It is odorless, colorless, and tasteless, and therefore cannot be detected by the human senses. Radon can be found virtually everywhere, in at least small concentrations, since its predecessor, radium-226 is found in all rock and soil. In the outdoor air, radon is diluted to low concentrations. However, indoors, it can accumulate to harmful levels as a result of a combination of factors, including building construction techniques and geologic characteristics. Exposure to elevated levels of radon is associated with an increased risk of developing lung cancer. The United States Environmental Protection Agency (USEPA) has estimated that between 5,000 and 20,000 of the approximately 125,000 lung cancer deaths per year in the United States may be due to radon. Exposure to radon has been well documented in studies of uranium miners and verified by animal studies. In view of this, four picocuries per liter (4.0 pCi/l) has been established as the continuous exposure guideline recommended by the United States Environmental Protection Agency (USEPA) and Center for Disease Control (CDC).<sup>1,2</sup> Corrective action is therefore recommended for homes in which there is an annual average exposure to radon greater than or equal to 4.0 pCi/l.

## BACKGROUND

In January of 1985, the Pennsylvania Department of Environmental Resources notified the State of New Jersey of the discovery of elevated radon concentrations in a residence located on a uranium rich geologic feature in Boyertown, Pennsylvania. Known as the Reading Prong, this feature extends from Pennsylvania through New Jersey and into New York State. The level of radon discovered at this residence was well over the average level of radon that uranium miners are allowed under existing federal regulations. Examination of New Jersey's geological and radiological data indicated that the radon problem experienced in Pennsylvania could also exist in New Jersey. Currently, it is estimated that as many as 1.9 million New Jersey homes have potentially elevated radon levels; therefore, identification of these homes through sampling is a high priority.

The State's initial response was to establish a toll-free information hot-line to address the public's questions on radon. Concurrently, reports of elevated radon levels in Pennsylvania were publicized in the New York Times, adding to the concerns of New Jersey residents, and prompting hundreds of calls to the information hot-line.

In response to the potentially significant health risk posed by radon and its decay products, legislation was sponsored in New Jersey to provide \$3.2 million for a 6,000 home Statewide Scientific Study of radon; a joint NJDEP/NJDOH epidemiological

study; a confirmatory monitoring program which assists homeowners in identifying and remediating their own radon problems; and a public informational/outreach program used for the dissemination of radon information throughout the state. In August, 1986 a second bill, signed into law provided an additional \$1 million to create programs for the certification of radon testing and mitigation firms throughout the State. Regulations to implement the NJDEP's certification program for these testing and mitigation firms are expected to be in effect this year.

#### PROGRAM COMPONENTS

The current overall goal of the State Radon Program is to maintain and expand its public information and education program in order to keep the public abreast of the potential hazard posed by radon gas and radon progeny; to define the extent and degree of the radon problem (geographically); to enhance public understanding of mitigation methods; and to assure high quality radon measurement/mitigation services to New Jersey residents through a mandatory certification program, currently under development.

Since its inception in July of 1985, the Radon Program's Information Line has received over 75,000 calls and mailed out over 40,000 information packets on measurement and mitigation. The number of calls received, packets mailed and phone consultations conducted on a monthly basis (July, 1985 through August, 1988) are shown in Figure I and Table I). The significant increases since July, 1985 indicate an increased

public awareness to the radon issue. Variations in numbers shown in Table One reflect events such as news media coverage.

As an essential element, outreach/education serves to provide information on radon to interested parties through its toll-free information line; mailing of brochures; and presentations to any interested groups of the general public. Expansion of this outreach effort is anticipated to double to assist homeowners in their understanding of the radon issue; therefore, reducing the public's exposure to this environmental hazard.

In general, the keystone of the public information program is the toll-free information line (1-800-648-0394) operated from the DEP's radon office in Chester, NJ. As of March 1, 1988, DEP staff had received and responded to more than 75,000 telephone inquiries, and mailed out more than 40,000 general information packages. Included in these information packets are EPA booklets entitled Citizens Guide to Radon and Radon Reduction Methods in addition to DEP prepared lists of testing and mitigation firms and the New Jersey Department of Health's brochure Facts and Recommendations on Exposure to Radon. As the knowledge of radon has grown among New Jersey residents, so has the sophistication and complexity of the questions they ask. A great deal of staff time is spent providing telephone consultation to residents wanting to discuss the interpretation of their radon test results, wishing detailed comparisons of the relative effectiveness of different remediation methods, or wishing to

know the probability of occurrence of a radon problem in their area.

In October of 1986, the New Jersey Department of Environmental Protection (DEP) retained Camp, Dresser & McKee, an environmental engineering firm to conduct a \$1.3 million statewide study of Radon in New Jersey. The purpose of the statewide study was to define the extent and degree of the radon problem. Preliminary data released in September, 1987, indicated that thirteen percent (13%) of the 165 public buildings tested had radon levels greater than or equal to 4.0 pCi/l. Analysis of data has permitted the division of the state into a three tier system with houses in Tier I having the highest probability of having elevated radon levels (>4 pCi/l) and Tier III the lowest. It is recommended that houses located in Tier I municipalities test for Radon as soon as possible. For Tier II municipalities, testing is recommended within a few months. Homeowners residing in Tier III municipalities should test for Radon if they are concerned.

Initial funding which was provided for the 6,000 home Statewide Scientific Study of radon has allowed the State to define the regions and housing types at risk of elevated radon throughout New Jersey. As a result, this has enabled the public outreach campaign to motivate New Jersey residents to conduct initial radon screening.

In addition, DEP staff have participated in over 400 public, professional, and scientific meetings/training sessions. The

Program has awarded special purpose contracts to behavioral scientists at Rutgers University to conduct a public perception survey on risks, and to Holt & Ross, a firm specializing in public information, to provide assistance in the designing of radon informational brochures and slides, and to assist the DEP in raising awareness of NJ residents concerning radon.

Rutgers University, contracted by the DEP, is currently conducting a risk perception study to investigate the public's perceptions of environmental hazards. This investigation is attempting to provide detailed information about hazard attitudes derived from communities with diverse hazard experiences. Preliminary results have shown that New Jersey residents regard the DEP as being a reliable and accurate source of information.

Holt & Ross, a public relations firm employed by the Department to assist in the radon outreach program, has developed a slide show, pamphlets and brochures which are used extensively by the program for presentations throughout the State. The slide presentation is presently being expanded and re-packaged as a video tape for distribution in local N.J. libraries.

In New Jersey, 1.9 million homes are potentially at risk of having elevated levels of radon gas. Identification of homes through sampling is therefore a high priority. The commercial radon industry, though small, has been expected to provide this analytical capability. It was noted that unregulated growth of a small industry could present significant potential for error and consumer fraud. To protect New Jersey homeowners, confirmatory

testing was offered to those who had commercial radon tests performed with resultant radon concentration levels equal to or greater than 4. Any resident who does an initial test for radon through a commercial firm, and obtains a result greater than or equal to 4 pCi/l can contact the toll-free information line for confirmatory testing by the DEP. Confirmatory monitoring is offered free of charge by the State through the county and local health departments. This also allows the State to validate initial test results of commercial firms and to encourage homeowners with elevated radon levels to remediate.

Program staff, with the assistance of local health officers, have conducted confirmatory monitoring tests, ~~free of charge~~, at approximately 7,100 homes with initial firm results greater than or equal to 4.0 pCi/l. This confirmatory monitoring program both serves to ensure the quality of test results provided to New Jersey homeowner and provides the Department with its confirmatory testing database.

Commercial firms have voluntarily submitted data, summarized by municipality and zip code, for radon measurements made in over 25,000 homes. An increase in the number of homeowners seeking commercial radon services has resulted in rapid growth in the number of commercial testing firms. The increase in testing firms along with the increase in the number of homes for which commercial firms have voluntarily submitted data for are shown in Figure II.



Corrective action is recommended for homes in which there is an annual average exposure to radon greater than or equal to 4 pCi/l.<sup>3</sup> Should remediation be required for elevated levels of radon, homeowners can obtain a list of mitigation firms through the information line, in addition to free post-remediation testing to determine if the initial levels have been reduced. Appropriate action should be taken in accordance with the following revised guidelines: For results over 200 pCi/l, action should be taken promptly to reduce radon levels within two weeks on a temporary basis; permanent remedial measures should be implemented within 3 months. For radon levels between 20 and 200 pCi/l, temporary remedial action should be taken within three months; permanent controls should be installed within 6 months. For radon levels between 4 and 20 pCi/l, annual averages should be obtained. It is recommended that permanent controls be installed within one year if the annual average radon result is between 8-20 pCi/l, and two years if the annual average is between 4-8 pCi/l.

The Radon Program has performed follow-up testing of approximately 1,500 residences in which remediation has been done to reduce the levels of radon. The DEP provides follow-up (post-remedial) radon testing to determine the effectiveness of mitigation work. Confirmatory monitoring and technical consultations on remediation techniques have been provided for over 100 public buildings. Draft guidelines have also been developed entitled "Testing for Radon in Non-Residential Buildings." The number of confirmatory field visits, health

officer tests, and post-remedial/follow-up tests (from July, 1985 through August, 1988) are shown in Figure I and Table I.

Presently the Program has voluntary testing and mitigation certification programs for private firms. These programs were developed to provide the public with high quality radon measurement/mitigation services. Firms which meet the specifications of the certification application are allowed to participate. The Radon Program is in the process of implementing a mandatory certification program to assure that high quality radon measurement/mitigation services are provided to New Jersey residents. Currently, there are over 80 radon testing firms and over 30 radon mitigation firms participating in the State's Voluntary Certification program. Results from these firms will provide the State with an additional database to complement the data from the statewide scientific study.

To date, 175 testing firms have filed applications for approval in the State's Voluntary Certification Program, of which 87 have been accepted. In addition, over 60 mitigation firms have submitted applications, of which 35 have been accepted.

Following the identification of a group of homes with very high radon levels in Clinton, New Jersey, the NJDEP initiated a Radon Cluster Identification Program. The cluster program consists of the initial identification of a house with radon levels of 200 pCi/l or greater. As a result the Department is interested in ascertaining whether the 200 pCi/l index house(s) is typical or atypical of that area. At the level of 200 pCi/l

or greater immediate action is needed. To develop more information, semi-random testing is done around the index house using known test values in the neighborhood, the geology of the area and radiological ground level tests as a guide. Outreach efforts in the community are an essential part of this effort to enlist resident support. To successfully implement this program, local municipalities were invited to assist through conducting public informational meetings and testing in selected areas. To date, 22 cluster groups have been addressed by the NJDEP/local health officials. Due to the Cluster Program's success in increasing public awareness of radon in the selected areas, the DEP will be expanding its cluster efforts in the future.

Through the supporting of radon remediation research projects, the program has been able to enhance the public's understanding of radon mitigation methods. One such project presently being conducted along with the EPA, Lawrence Berkley Labs., Oak Ridge Laboratories, and Princeton University is the House Evaluation Project (HEP). This project aims to develop and test mitigation plans for 15 homes throughout New Jersey. Currently, 6 of these houses have utilized the mitigation plans provided for remediating radon. Post-remedial testing of the homes has shown that all of the remediations have been successful, and that mitigation methods can be both easy to implement and cost-effective.

The DEP has also issued updated interim guidelines for radon testing in non-residential structures to provide guidance on testing these buildings. A low interest loan program is

available to assist homeowners with radon remediation costs through the New Jersey Housing and Mortgage Finance Agency (HMFA). For additional information, homeowners may contact the loan program by dialing 1-800-NJ-HOUSE.

Radon presentations are provided for all groups upon request. These groups have included homeowners, realtors, scientific societies, civic organizations, etc. An informative slide show is presented and handouts are made available. In addition, the New Jersey Radon Program has participated in public television presentations in New Jersey, and has been featured in newspaper articles and cable television. Following preliminary results of the Statewide Study, the number of requests for presentations has increased significantly.

The Radon Program is also cooperating with the NJDOH's Special Epidemiological Services in conducting an epidemiological study to determine the relationship between exposure to radon in a residential setting and an increased risk of developing lung cancer. DEP staff have assisted DOH in the monitoring of more than 500 homes.

## Summary

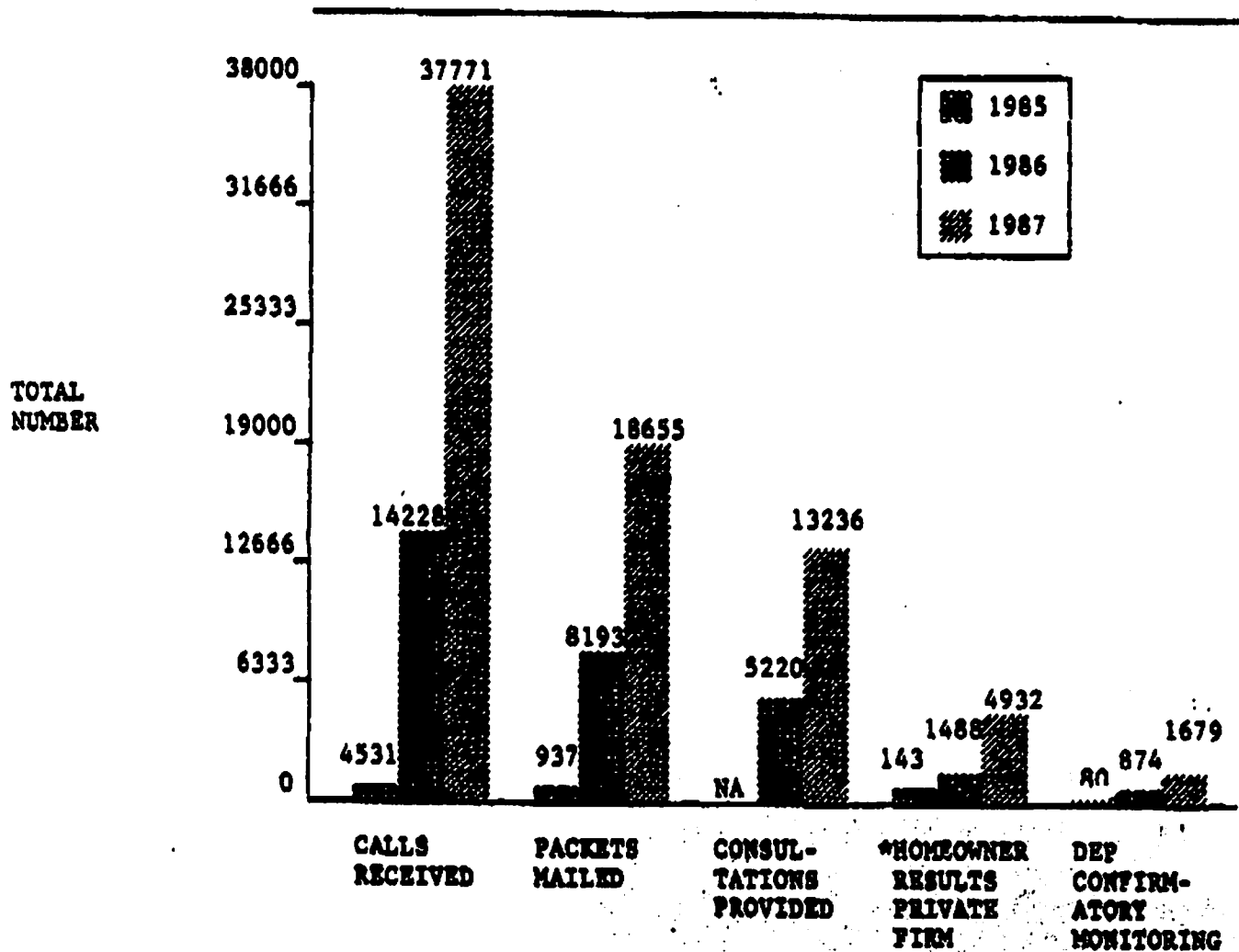
In summary, the New Jersey radon problem is characterized by up to one-third of the homes in northern New Jersey potentially having unacceptably high levels of radon. Knowledge of the issue has spread substantially, but a majority of potentially affected New Jersey homeowners have apparently not yet tested for radon. Both testing and remediation efforts should be increased.

Based on the preliminary results from the Statewide Scientific Study and data collected through these other components of the State's Radon Program, the DEP judges residential exposure to radon to be the most serious environmental health threat facing New Jersey residents today. Through the statewide scientific study, the department has been able to identify areas of the State which are at greater risk for radon, and thereby recommend radon testing with regard to urgency.

New Jersey residents currently have ready access to radon information, testing services and remediation services, and a mandatory certification process is under development. Research is also underway to further examine the radon risks and remediation methods. The public information aspects of the radon program should be continued and enhanced to focus on identifying and implementing more effective means of encouraging residents to test for radon. Through the offering of these informational and technical services to New Jersey residents, we hope to encourage more homeowners throughout the State to test for radon. Testing

is the only way to detect elevated radon levels, and consequently lead to the reduction of this significant environmental hazard. Trained radiation program staff are available to assist homeowners at the New Jersey Department of Environmental Protection's Radon Information Line.

**FIGURE I**  
**SUMMARY REPORT RADON PROGRAM**  
**1985, 1986, 1987**

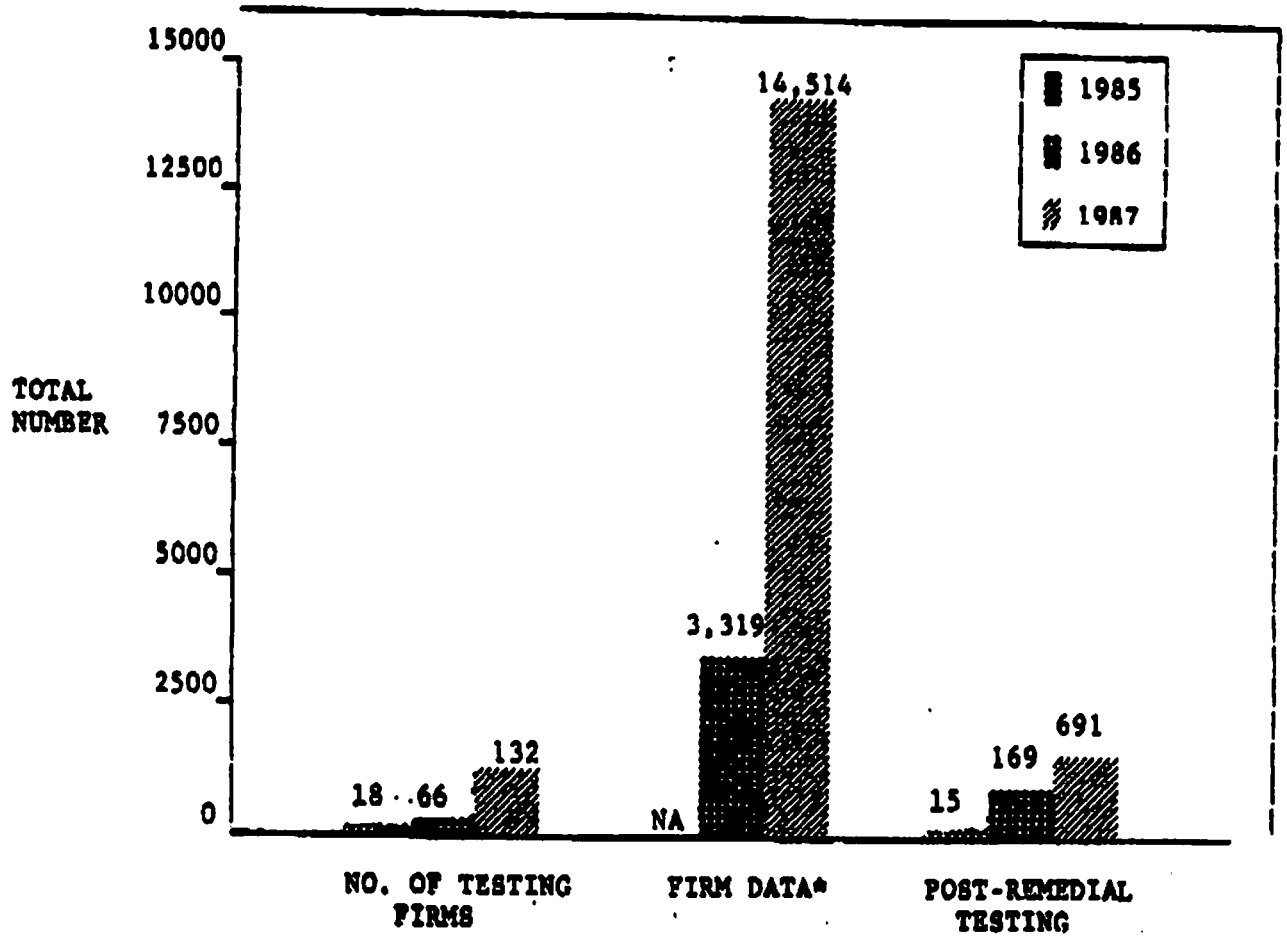


NA = NUMBER OF CONSULTATIONS NOT RECORDED IN 1985.

\*NUMBER OF HOMEOWNERS WHO INFORM THE RADON SECTION OF RADON/RADON DECAY PRODUCT TESTING CONDUCTED BY COMMERCIAL FIRMS.

YEARLY SUMMARY  
 RADON

FIGURE II  
 SUMMARY REPORT RADON PROGRAM  
 1985, 1986, 1987



\* NO. OF HOMES IN WHICH COMMERCIAL FIRMS HAVE VOLUNTARILY SUBMITTED DATA FOR RADON MEASUREMENTS

SUMMARY REPORT PROGRAM  
 RADON



TABLE I

MONTHLY SUMMARY REPORT - RADON SECTION  
(JULY 1965 to DECEMBER 1967)

1967

1966

1965

| MONTH     | 1965           |                 |                        |                   |                              |                        |                       |                |                 |                        | 1966              |                              |                        |                       |                |                 |                        |                   |                              |                        | 1967                  |                |                 |                        |                   |                              |                        |                       |  |  |
|-----------|----------------|-----------------|------------------------|-------------------|------------------------------|------------------------|-----------------------|----------------|-----------------|------------------------|-------------------|------------------------------|------------------------|-----------------------|----------------|-----------------|------------------------|-------------------|------------------------------|------------------------|-----------------------|----------------|-----------------|------------------------|-------------------|------------------------------|------------------------|-----------------------|--|--|
|           | Calls Received | Packages Mailed | Consultations Provided | Homeowner Results | DTP Confirms - Agency Visits | Health Officer Testing | Post-Remedial Testing | Calls Received | Packages Mailed | Consultations Provided | Homeowner Results | DTP Confirms - Agency Visits | Health Officer Testing | Post-Remedial Testing | Calls Received | Packages Mailed | Consultations Provided | Homeowner Results | DTP Confirms - Agency Visits | Health Officer Testing | Post-Remedial Testing | Calls Received | Packages Mailed | Consultations Provided | Homeowner Results | DTP Confirms - Agency Visits | Health Officer Testing | Post-Remedial Testing |  |  |
| January   | 688            |                 |                        |                   |                              |                        |                       | 1005           | 578             | -                      | 59                | 31                           | NA                     | 7                     | 1703           | 864             | 770                    | 43                | 102                          | 22                     |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| February  | 152            |                 |                        |                   |                              |                        | 1181                  | 742            |                 |                        | 72                | 31                           | NA                     | 5                     | 2895           | 1408            | 923                    | 324               | 110                          | 51                     |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| March     | 646            |                 |                        |                   |                              |                        | 1197                  | 349            |                 |                        | 251               | 80                           | NA                     | 8                     | 3489           | 1596            | 1713                   | 570               | 134                          | 141                    |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| April     | 545            |                 |                        |                   |                              |                        | 1425                  | 475            |                 |                        | 170               | 62                           | NA                     | 6                     | 4282           | 1784            | 1737                   | 685               | 134                          | 139                    |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| May       | 678            |                 |                        |                   |                              |                        | 837                   | 315            |                 |                        | 82                | 137                          | NA                     | 13                    | 2996           | 916             | 1375                   | 1037              | 287                          | 246                    |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| June      |                |                 |                        |                   |                              |                        | 649                   | 222            |                 |                        | 186               | 86                           | NA                     | 7                     | 2023           | 606             | 816                    | 426               | 159                          | 281                    |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| July      |                |                 |                        |                   |                              |                        | 847                   | 458            |                 |                        | 114               | 128                          | NA                     | 24                    | 1972           | 816             | 582                    | 183               | 122                          | 98                     |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| August    |                |                 |                        |                   |                              |                        | 2221                  | 1962           |                 |                        | 59                | 43                           | NA                     | 7                     | 2427           | 998             | 879                    | 726               | 65                           | 66                     |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| September |                |                 |                        |                   |                              |                        | 1238                  | 937            |                 |                        | 85                | 56                           | NA                     | 9                     | 5733           | 3991            | 1612                   | 272               | 86                           | 27                     |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| October   |                |                 |                        |                   |                              |                        | 1067                  | 660            |                 |                        | 103               | 55                           | NA                     | 20                    | 3494           | 2170            | 1014                   | 461               | 151                          | 49                     |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| November  |                |                 |                        |                   |                              |                        | 1212                  | 742            |                 |                        | 191               | 75                           | NA                     | 26                    | 2282           | 1203            | 778                    | 208               | 109                          | 44                     |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| December  |                |                 |                        |                   |                              |                        | 1358                  | 733            |                 |                        | 136               | 90                           | NA                     | 24                    | 4295           | 2361            | 1109                   | 497               | 200                          | 129                    |                       |                |                 |                        |                   |                              |                        |                       |  |  |
| TOTALS    | 4,531          | 937             | NA                     | 143               | 80                           | NA                     | 24,228                | 8,193          | 5,220           | 1,488                  | 874               | 27                           | 154                    | 27,771                | 18,655         | 13,236          | 6,932                  | 1,679             | 1,213                        | 69                     |                       |                |                 |                        |                   |                              |                        |                       |  |  |

Number of homeowners who inform the Radon Section of radon/radon decay product testing conducted by commercial firms.

| MONTH                    | CARS RECEIVED | PACKETS MAILED | CONSULTANTS PROVIDED | HOMEOWNER RESULTS (*) | DEP. CONF. TEST | H.O. TESTS | POST-REMEDIAL TESTS |
|--------------------------|---------------|----------------|----------------------|-----------------------|-----------------|------------|---------------------|
| JANUARY                  | 5025          | 2704           | 1294                 | 757                   | 176             | 97         | 63                  |
| FEBRUARY                 | 2643          | 938            | 1196                 | 534                   | 134             | 256        | 103                 |
| MARCH                    | 3555          | 1396           | 1464                 | 660                   | 220             | 412        | 82                  |
| APRIL                    | 2678          | 977            | 929                  | 399                   | 290             | 141        | 99                  |
| MAY                      | 2164          | 549            | 790                  | 227                   | 423             | 156        | 104                 |
| JUNE                     | 1469          | 446            | 667                  | 342                   | 72              | 13         | 26                  |
| JULY                     | 1317          | 326            | 590                  | 293                   | 53              | 16         | 18                  |
| AUGUST                   | 1360          | 323            | 584                  | 203                   | 50              | 4          | 11                  |
| TOTALS TODATE:<br>9/1/88 | 20,211        | 7,659          | 7,514                | 3,415                 | 1,418           | 1,095      | 506                 |

TABLE I (cont.)  
MONTHLY SUMMARY REPORT- RADON SECTION  
(JANUARY 1988 to AUGUST 1988)

(\*) # of people who inform Radon Section  
of results by commercial firms.

## Bibliography

1. U.S.E.P.A. Radon Reference Manual, 520/1-87-20, September, 1987.
2. U.S.E.P.A. A Citizen's Guide To Radon: What It Is And What To Do About It, OPA-86-004, August, 1986.
3. U.S.E.P.A. Radon Reduction Methods: A Homeowner's Guide, OPA-87-010, September, 1987.