

The Castleisland Radon Survey

*Catherine Organo - Scientific Officer
Natural Radioactivity Advice and Information Section
RPII*



Overview of the presentation

- Origin and objective of the survey
- Methodology
- Results
- Discussion
- Conclusions



Origin and objective of the survey

- **July 2003**: a house located in the vicinity of Castleisland was identified with an average radon concentration seasonally adjusted of **49,000 Bq/m³** (highest level ever measured in a house in the country)
- Using exposure-dose conversion factor of 1 mSv per 40 Bq/m³ and building occupancy of 7,000 h/y:
 - 49,000 Bq/m³ → 1,200 mSv/y or **daily dose 3.4 mSv**
 - 89 Bq/m³ → 2.25 mSv/y



- Householder immediately contacted by phone
- Diagnosed with **lung cancer** in March 2003 and his wife had died of same illness in 1998
- Both **non-smokers** and diagnosed at **early age** (suspect radon)
- Remedial work completed 2 months after house was discovered and average radon concentration brought down to $\approx 600 \text{ Bq/m}^3$
- Why in this house? Investigation not possible, priority had to be given to remediation (geology + house features)

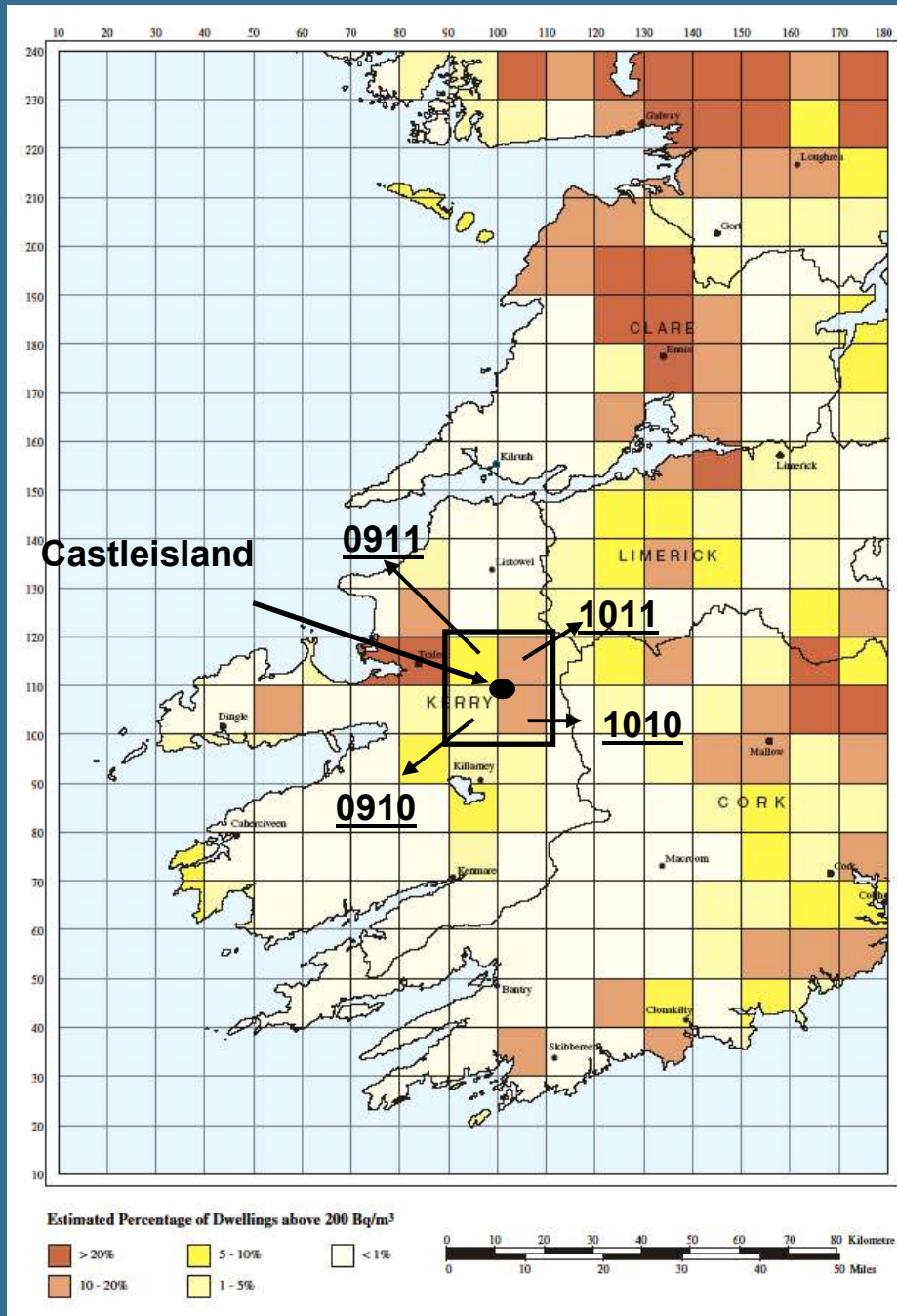


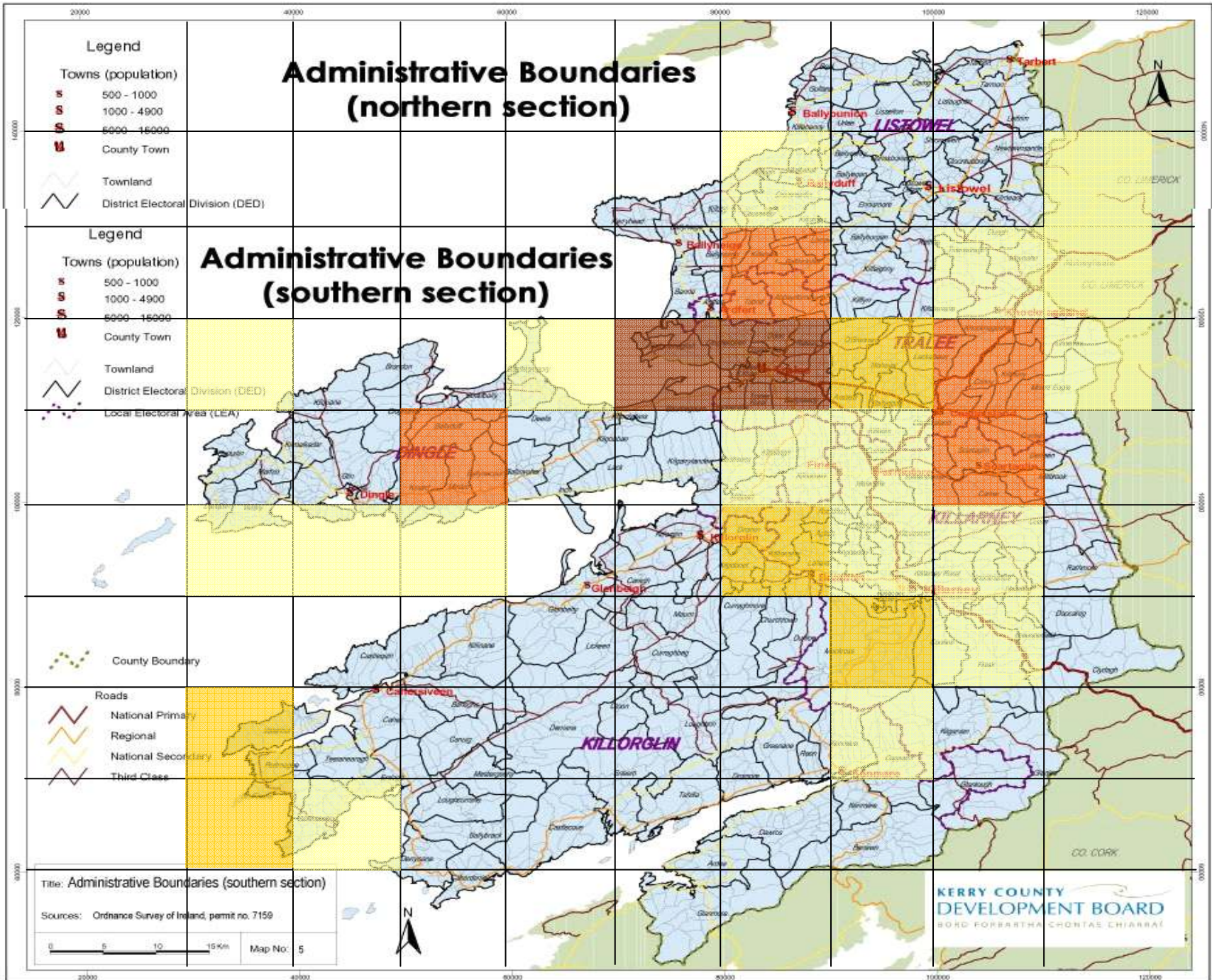
■ The direct consequences

- General population: newspapers articles, TV and radios interviews; local meetings organised to advise householders to carry out measurements
- Scientific community: JRP, NRPB Radon Newsletter, CancerWISE, APSM, retrospective radon measurements (UCD)
- **Castleisland Survey** → possibility that other houses in the Castleisland area could have similar extreme radon concentrations ?



Methodology





■ Previous radon measurements in the area

- Up to 6,000 Bq/m³ previously measured in Tralee grid square (> 25% of homes estimated to exceed 200 Bq/m³)
- Adjoining western grid square to Tralee 39%
- Highest radon concentration measured in the four grid squares around Castleisland from National Radon Survey = 661 Bq/m³



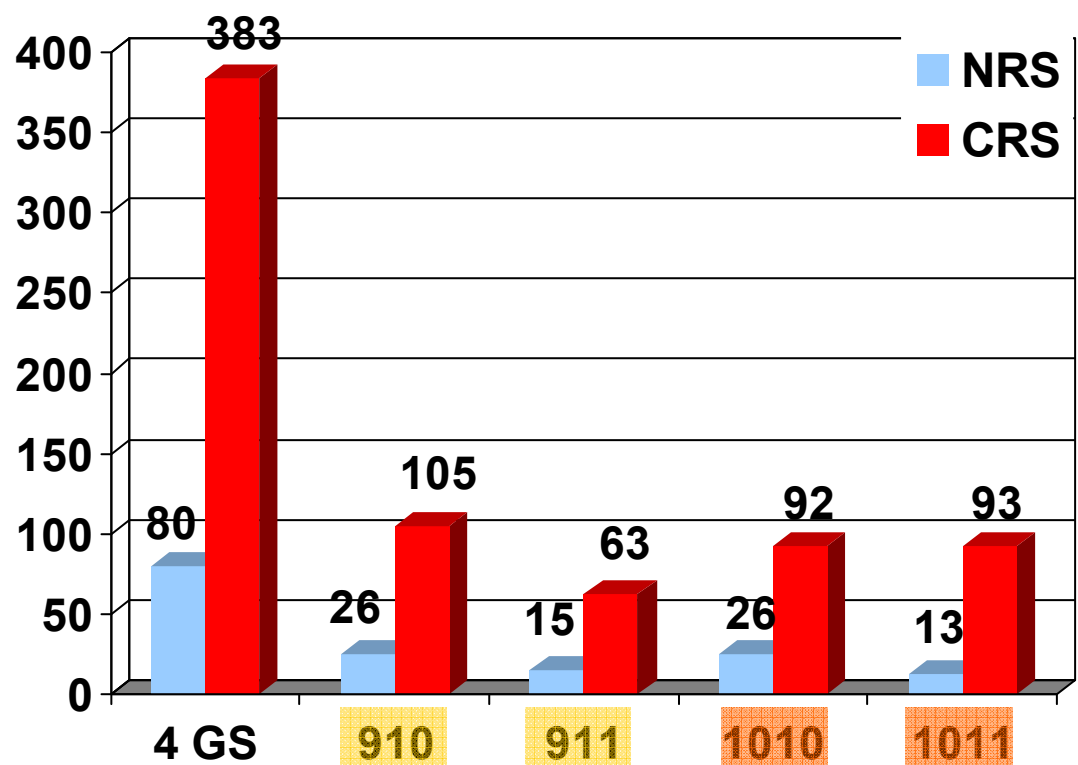
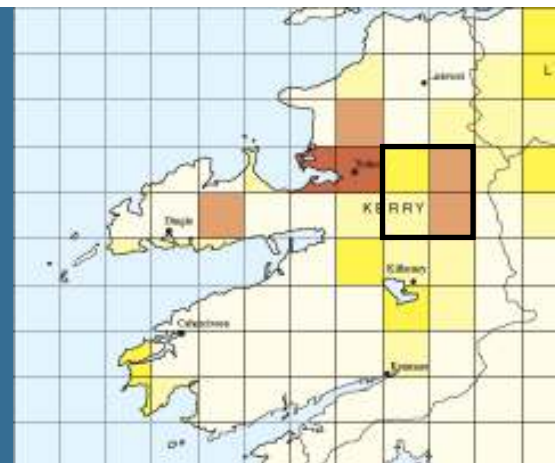
- **≈ 2,500 householders** in 4 grid squares **originally contacted** (GeoDirectory database of names – address - grid square coordinates)
- 418 agreed to participate but only **400** completed a valid survey (2 or more detectors returned)
- **383** were found afterwards to be **located in the 400 km² area** (17 excluded: Geodirectory data, information given by householder –map- and address vs map were contradictory)
- **353** could be precisely **allocated with a particular grid square** (30 excluded: too close to grid square boundary)



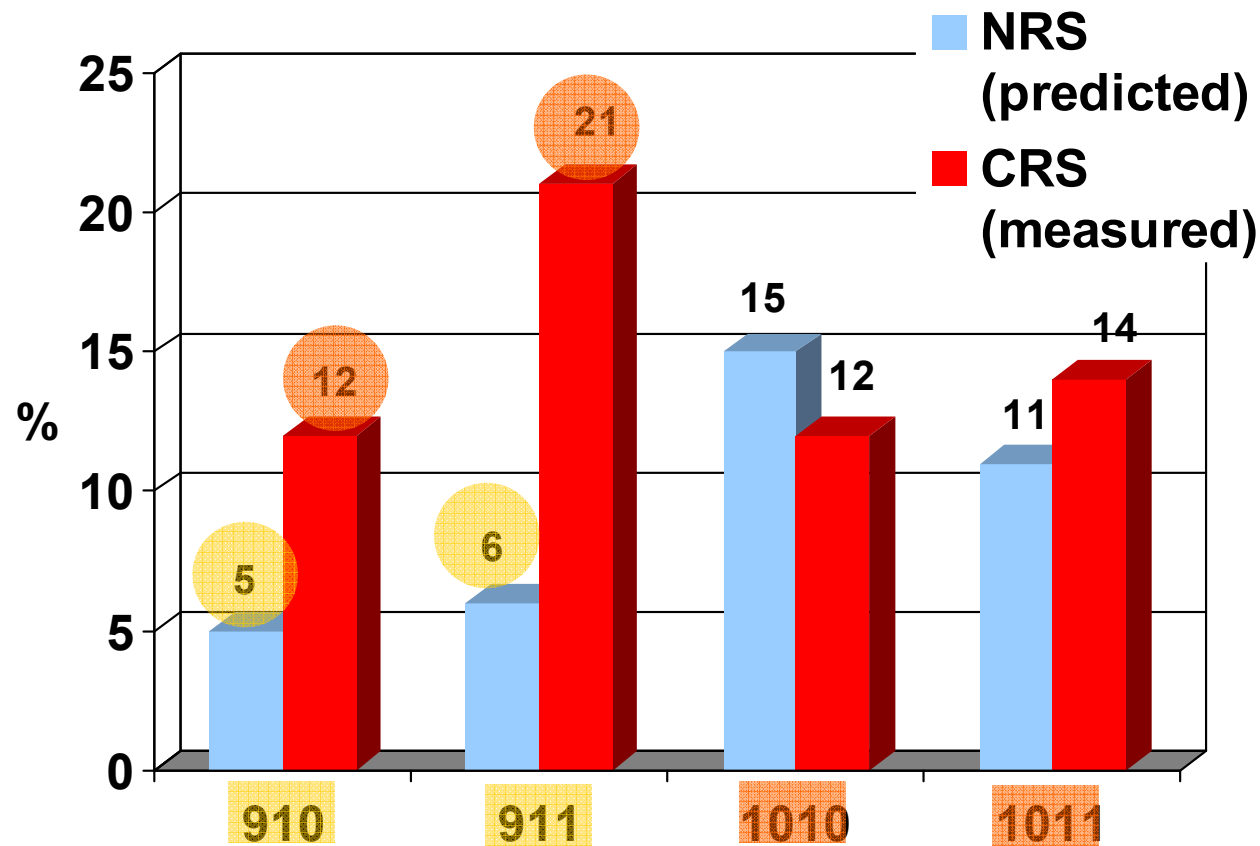
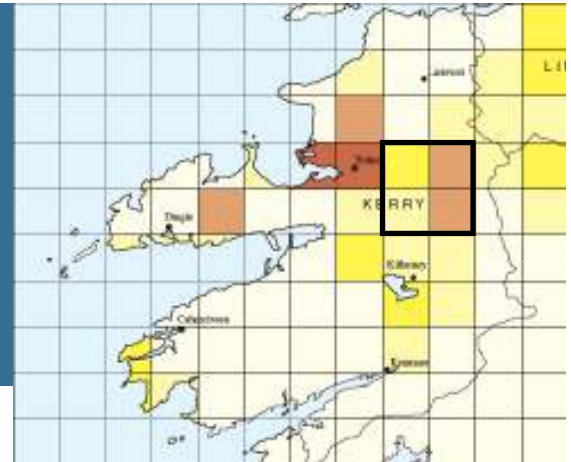
Results



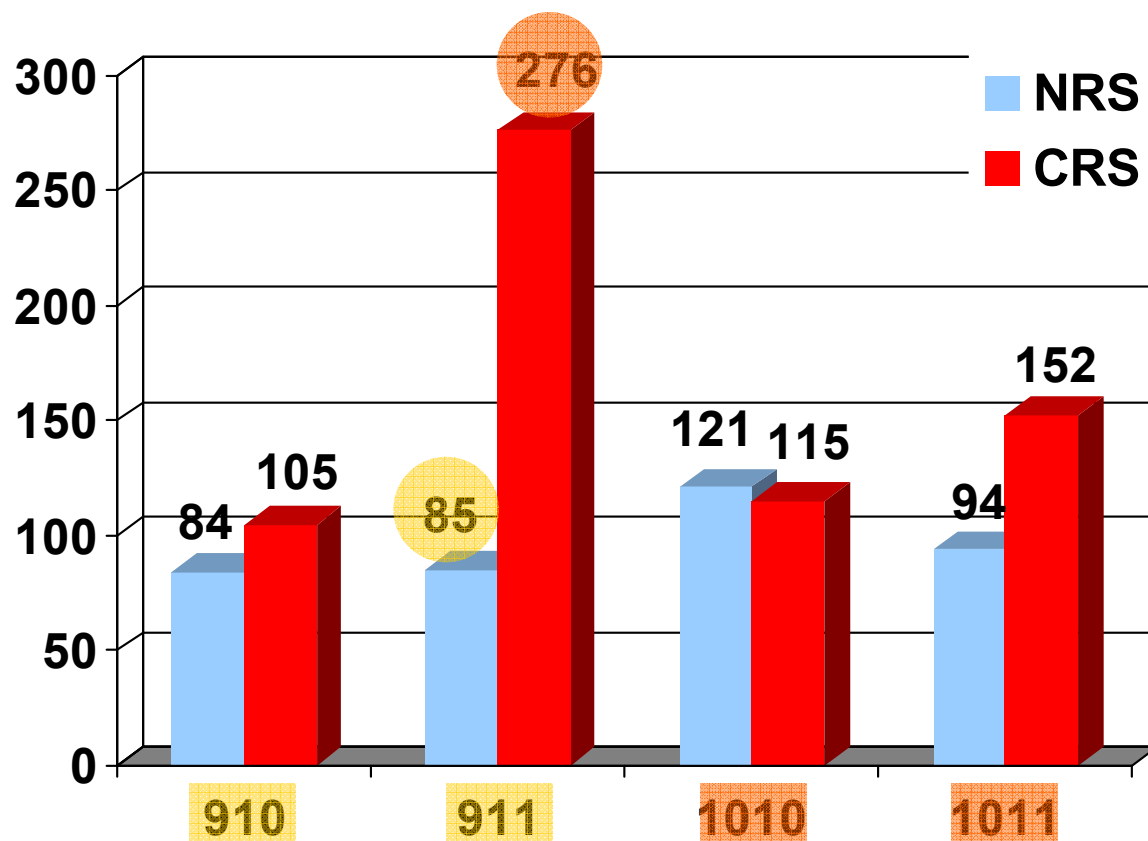
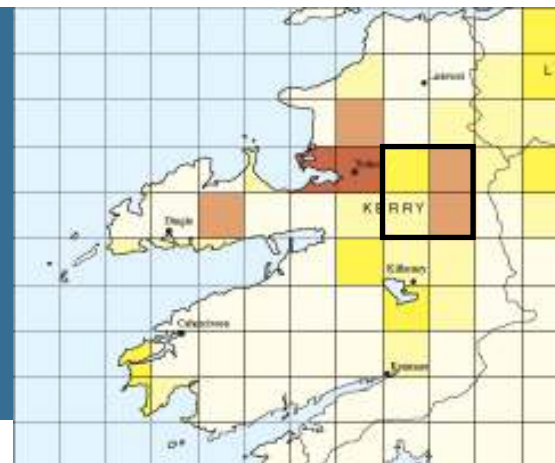
Number houses measured



% of houses measured > 200 Bq/m³ vs predicted %



Average radon concentrations



Discussion

■ Direct comparison with National Radon Survey

- Participants randomly selected from electoral register
- Awareness of radon much lower
- Measurements free of charge
- 1-year measurements
- Location of the houses (no cluster)
- No Building Regulations

■ Positive outcomes of the Castleisland Radon Survey

1. Identification of high houses in the studied area

- NRS: no home $> 800 \text{ Bq/m}^3$ found; CRS identified 6 (5 $> 1,000 \text{ Bq/m}^3$)
- 3 of the 10 highest homes measured in Ireland were identified by CRS (4 if we include Castleisland House)
- The max. radon concentration measured $6,184 \text{ Bq/m}^3$ during CRS is also the 4th highest ever measured in Ireland (also located in GS 911)

In the 4 GS	No. $> 200 \text{ Bq/m}^3$	No. $> 800 \text{ Bq/m}^3$	No. $> 1,000 \text{ Bq/m}^3$
Since 90s	87	13	11
CRS	54 (62%)	6 (46%)	5 (45%)



Discussion

2. **Effect of the remediation** of high houses (data available for 3 of the 4 GS): out of the 54 houses measured > 200 during the CRS, **only 5 (or 9%) have been remediated**

	House No.1	House No.2	House No.3	House No.4	House No.5
	911	1010	1010	1011	1011
Before (Bq/m ³)	4,156	945	524	622	292
After (Bq/m ³)	22	80	103	55	55
% reduction	99%	91%	80%	91%	81%

GS	911	1010	1011	4GS
Mean before (Bq/m ³)	276	115	152	147
Mean after (Bq/m ³)	211 (23% reduction)	101 (12% reduction)	143 (6% reduction)	130 (12% reduction)



Discussion

■ What next?

- Castleisland Radon Survey paper currently under review (JRP)
- **Re-designation** of the 4 grid squares / validation of the radon map **????**
 - ✓ Different methodologies used for NRS and CRS
 - ✓ Statistical advice
- **Repeat** localised survey elsewhere ?
- **GSI / RPII collaboration ?**
 - ✓ Airborne radiometric surveys
 - ✓ 'Radon potential' mapping?



Conclusions

- The survey did not identify other houses with extreme radon concentrations but it has identified of at least half of the houses > 200 currently known in the area. Therefore, this kind of exercise is a good **tool to be re-used in the future** (where?)
- 2 Grid Squares to be **re-designated** (issue currently being addressed) - Other grid square(s) **elsewhere?**
- Effect of the **remediation**
- Investigation of spatial **environmental factors** contributing to increased levels in homes (GIS and GSI)



Thank you for your attention

