

Radon Mapping in Southern California:

Recent California Geological Survey Radon Activities

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Major CGS Radon Projects for the DHS Radon Program Since 1990

- **Geologic Controls on the Distribution of Radon in California (1991)**
- **Geology, Soils and Indoor Radon at Elementary Schools (1993)**
- **Santa Barbara County and Ventura County Radon Potential Maps (1995)**
- **South Los Angeles County Radon Potential Map (2005)**

http://www.consrv.ca.gov/CGS/minerals/hazardous_minerals/radon/

South LA County Radon Mapping Project

- 9.02 million inhabitants (94.7% of county population)
- 1989 sq. mi. (southern 1/2 of the county)
- DHS short-term Rn data from 1729 sites (1990-2004)
 - Range: < 0.3 pCi/l to 159.6 pCi/l
 - 145 sites \geq 4 pCi/l (8.4% incidence rate)

220 Geologic Map Units (69 units have \geq 1 Rn test)

298 Zip Code Zones (233 zones have \geq 1 Rn test)

The South LA County Radon Potential Map

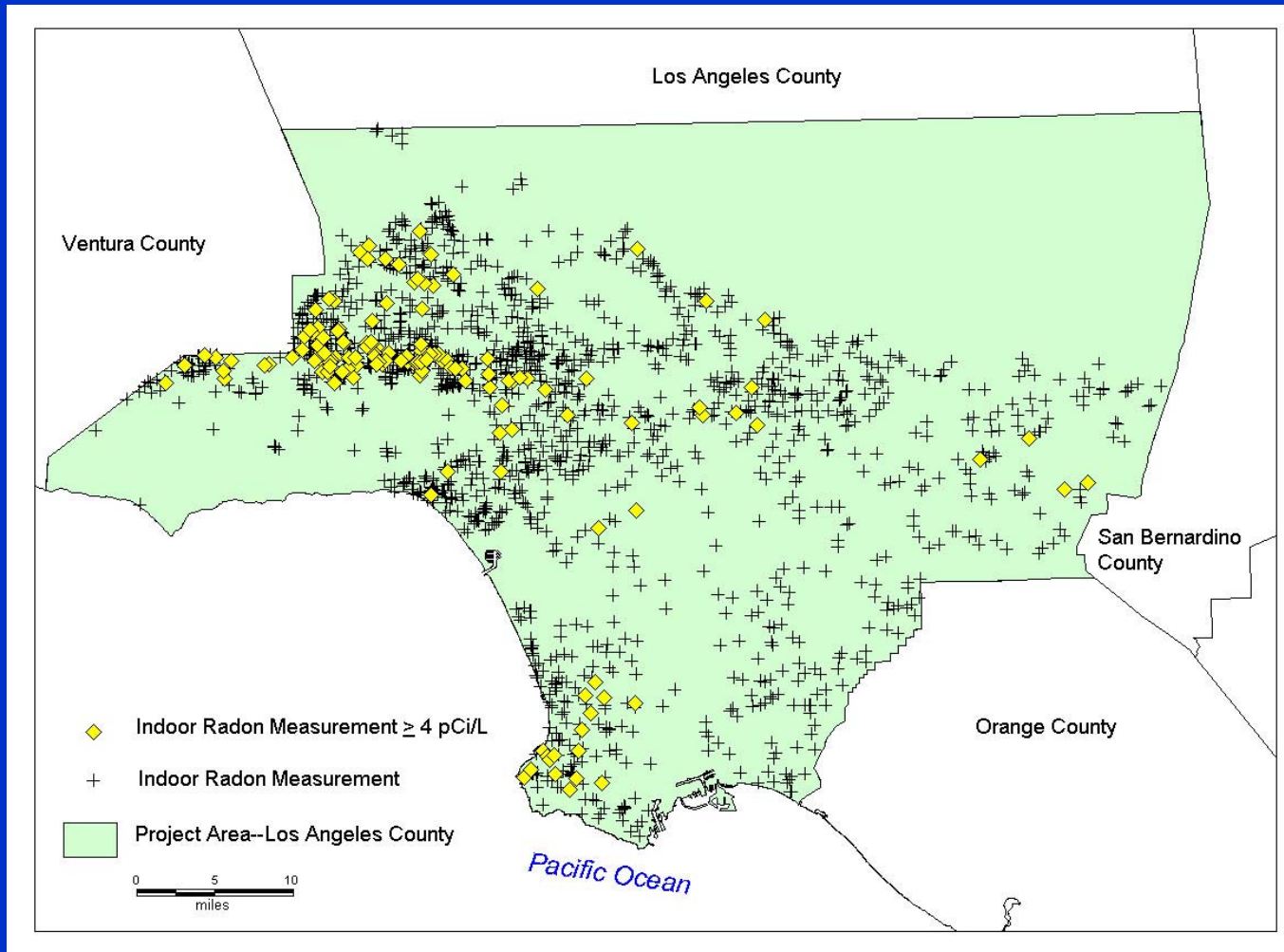
Goals

- Define and show areas of high, moderate and low potential for ≥ 4 pCi/l indoor-radon levels
- 1:100,000-scale map (1 inch = 1.58 miles)

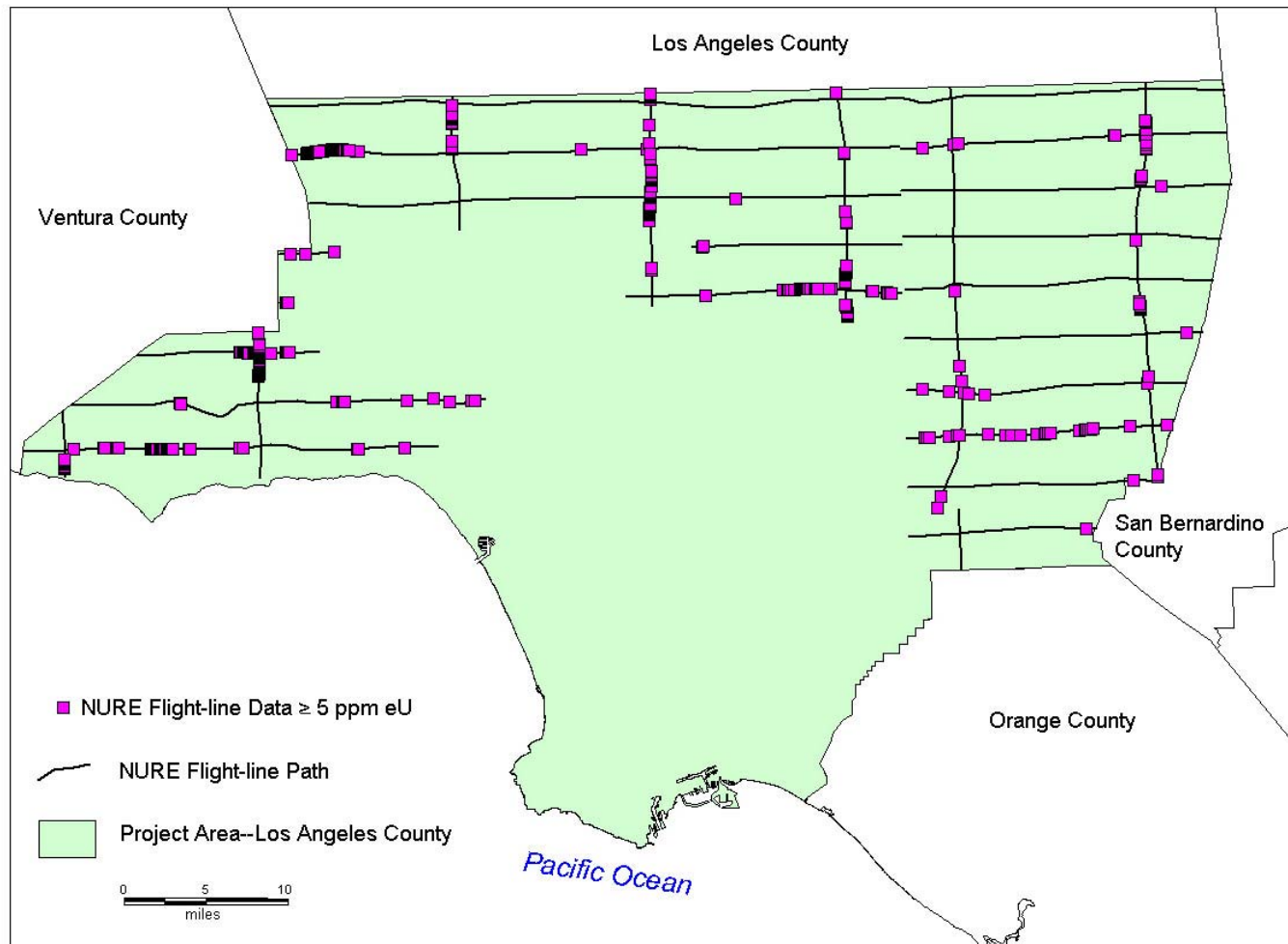
Data Utilized

- DHS short-term test data (1990-2004)
- NURE airborne radiometric data (1970s)
- Existing geologic maps

DHS Short-Term Rn Test Data



NURE Airborne Radiometric Data for eU



Mapping Procedure

- **Examine relationships between indoor-Rn data, NURE data and geologic units using GIS methods**
- **Identify geologic units with increased Rn potential**
- **Develop definitions for “High,” “Moderate,” and “Low radon potential geologic units**
- **Develop Rn-zone boundaries based on the distribution of high and moderate radon potential geologic units**
- **Confirm that final Rn zones are statistically distinct**

Geologic Units with Relatively High Radon Potential in Southern LA County

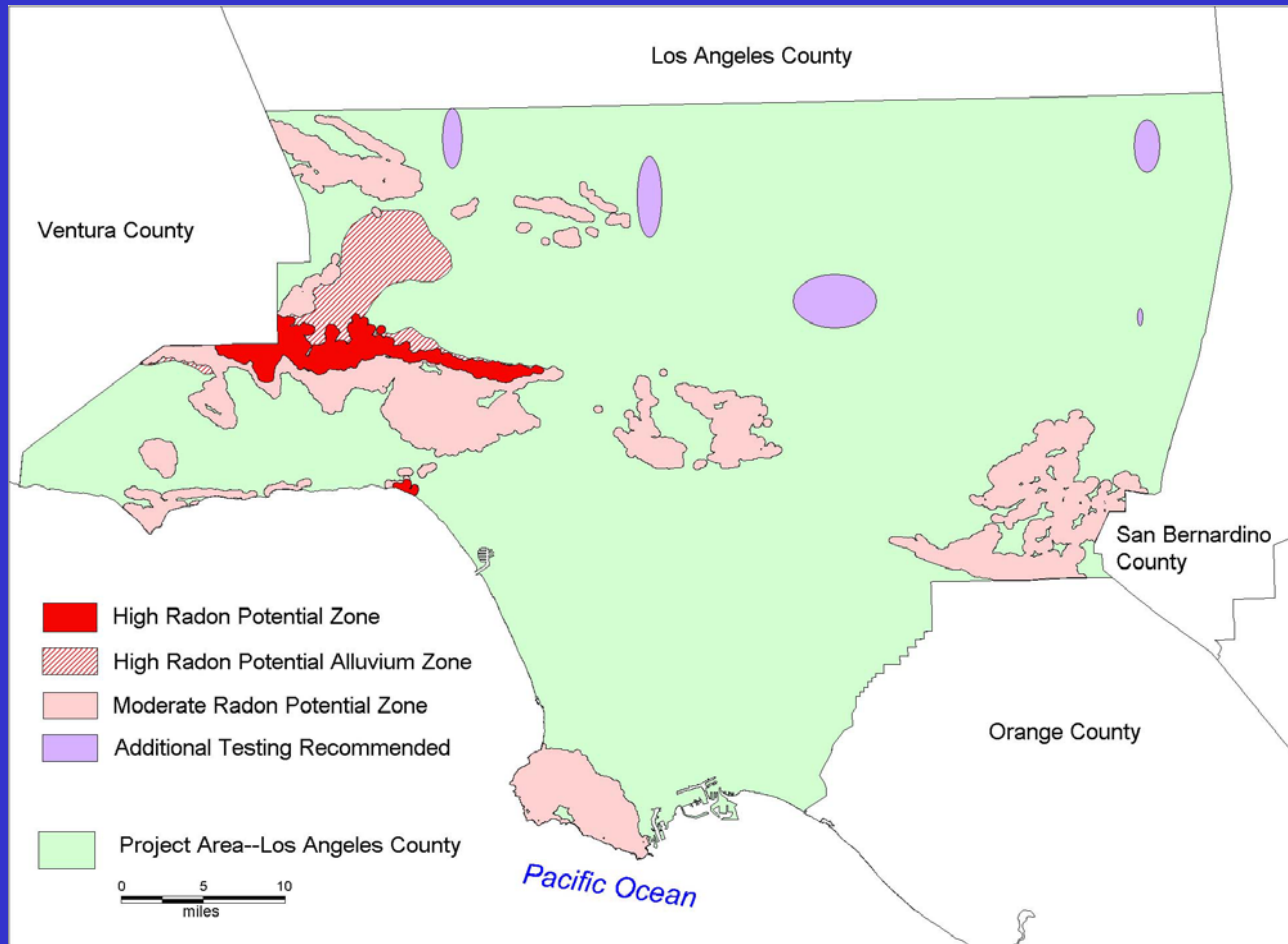
From Indoor-Radon Test Data

- **Miocene Marine Siliceous Shale**
- **Older or Recent Alluvium likely derived from Miocene Marine Shale**

From NURE Airborne Radiometric Data

- **Miocene Marine Siliceous Shale**
- **Quartz Diorite**
- **Gneiss**

Resulting Southern LA County Radon Potential Map



Results and Findings

Radon Potential Zones

Zone	Area (%)	Rate \geq 4 pCi/l (%)	High (pCi/L)
High	1.46	28.3	85.8
High-Qa	2.06	20.6	104.2
Moderate	11.75	9.7	36.6
Low	84.73	2.4	159.6

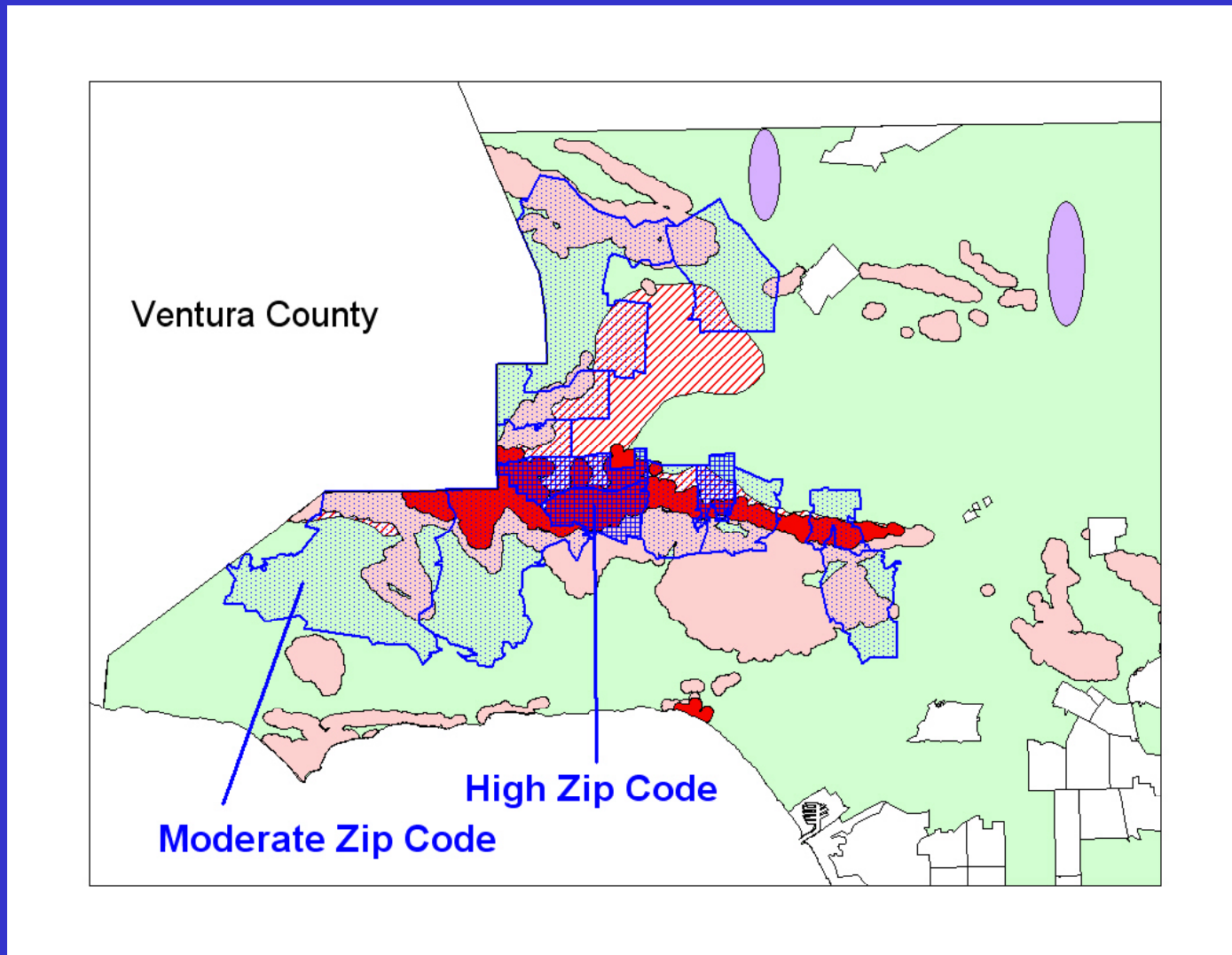
Population Exposure Estimates

Est. Population Exposed to \geq 4 pCi/l Indoor Air

High + Mod. Zones = 165,000 Low Zone = 188,000

Est. South LA County \geq 4 pCi/l Incidence = 3.9 %

Geologic Unit Based vs. Zip Code Zone Based Radon Maps



Radon Mapping—Future Considerations

Geologic based mapping will be more common

It is the best regional screening approach and points to areas needing additional study and possible regulation

More Indoor-Test Data are Needed!

Existing Rn mapping needs periodic review and revision, irrespective of origin

Additional types of data will be increasingly important for site-specific studies and detailed mapping

Ground-level radiometric data, soil gas data, soil porosity/permeability data, building information