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Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for Maywood, New Jersey



U.S. Department of Energy

ORNL/RASA-84/LJ6

Health and Safety Research Division

RESULTS OF THE RADIOLOGICAL SURVEY AT
59 AVENUE C (LJ006), LODI, NEW JERSEY

October 1984

Work performed as part of the
RADIOLOGICAL SURVEY ACTIVITIES PROGRAM

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U. S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-84OR21400

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RESULTS OF THE RADIOLOGICAL SURVEY AT
59 AVENUE C, LODI, NEW JERSEY

INTRODUCTION

A radiological survey of 59 Avenue C, Lodi, New Jersey, was conducted by Oak Ridge National Laboratory (ORNL) on August 22, 1984 at the request of the Department of Energy (DOE). Contaminated material was discovered during mobile gamma scan of Lodi, New Jersey.

The radiological survey conducted on this property was for the purpose of determining whether the property had any radioactive material onsite in excess of background radiation levels, and, if so, were these radioactive materials in excess of remedial action guidelines established by DOE such that the property could be "designated" for further investigation. This report summarizes the results of the "designation" survey performed on this property.

SURVEY METHODS

The radiological survey of the property included: (1) a gamma scan of the entire property outdoors; and (2) sampling of surface (0-15 cm) soil. No indoor survey measurements were performed. These survey methods followed the plan outlined in Reference 2. A comprehensive description of the survey methods and instrumentation have been presented in another report.³

SURVEY RESULTS

Applicable federal guidelines have been summarized in Table 1. The normal background levels for the northern New Jersey area are presented in Table 2. These data are provided for comparison with the survey results presented in this section. All direct measurement results presented in this report are gross readings at ground surface; background radiation levels have not been subtracted. Similarly, background

* The survey was performed by members of the Radiological Survey Activities Group of the Health and Safety Research Division at Oak Ridge National Laboratory under DOE contract DE-AC05-84OR21400.

concentrations have not been subtracted from radionuclide concentrations measured in environmental samples.

Systematic and Biased Soil Samples

Systematic and biased soil samples were taken from various locations on the property for radionuclide analyses. Locations of the systematic (LJ6S) and biased (LJ6B) samples are shown in Fig. 1, with results of laboratory analyses provided in Table 3. Concentrations of ^{232}Th exceeded the background concentrations of ^{232}Th anticipated for northern New Jersey in the biased soil samples collected at 59 Avenue C (LJ6B1). These results indicate that ^{232}Th -bearing residues exist on this site. The amount of material present is in excess of DOE guidelines (Table 1).

Gamma Radiation Levels

Results of the gamma scan of the surface of the property show areas where gamma exposure rates are in excess of background radiation levels. These locations are shown in Fig. 2, and the measurements are quantified. These locations suggest where potential ^{232}Th contamination exists. Gamma exposure rate levels up to 140 $\mu\text{R}/\text{h}$ exist on the ground surface of this property.

SUMMARY

Measurements taken at 59 Avenue C indicate that the property contains radioactive contamination primarily from the ^{232}Th decay chain, and to a lesser extent from the ^{238}U decay chain. This material is found in the locations shown in Fig. 2. Concentrations of radionuclides were elevated significantly above background, and the levels are in excess of DOE remedial action guidelines. It is recommended that this property be designated for further evaluation. A comprehensive radiological survey will be required to delineate the extent of contamination to plan any necessary remedial action.

REFERENCES

1. R. W. Doane and B. A. Berven, "Results of the Mobile Gamma Scanning Activities in Lodi, New Jersey," Oak Ridge National Laboratory, ORNL/RASA-84/3 (October 1984).
2. W. D. Cottrell, ORNL, to A. J. Whitman, DOE/HQ, correspondence, "Radiological Survey of Private Properties in Lodi, New Jersey" (August 15, 1984).
3. Oak Ridge National Laboratory, Procedures Manual for the ORNL Remedial Action Survey and Certification Activities (RASCA) Program, ORNL/TM-8600 (October 1982).
4. U.S. Department of Energy, Radiological Survey of the Middlesex Municipal Landfill, Middlesex, New Jersey, DOE/EV-0005/20, April 1980.
5. T. E. Myrick and B. A. Berven, State Background Radiation Levels: Results of Measurements Taken During 1975-1979, Oak Ridge National Laboratory, ORNL/TM-7343 (November 1981).

● systematic samples

▲ biased sample

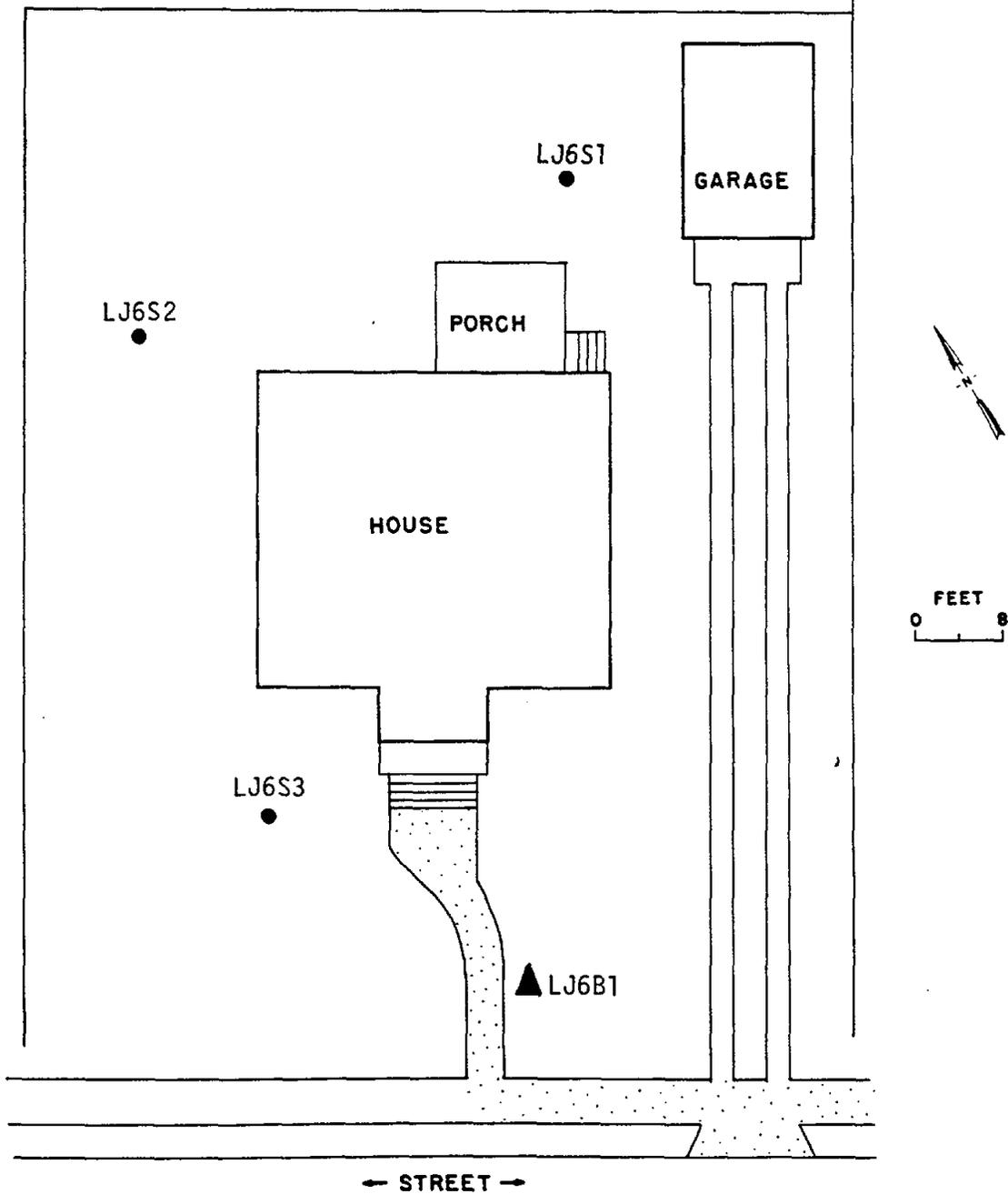


Fig. 1. Diagram showing locations of soil samples taken at 59 Avenue C.

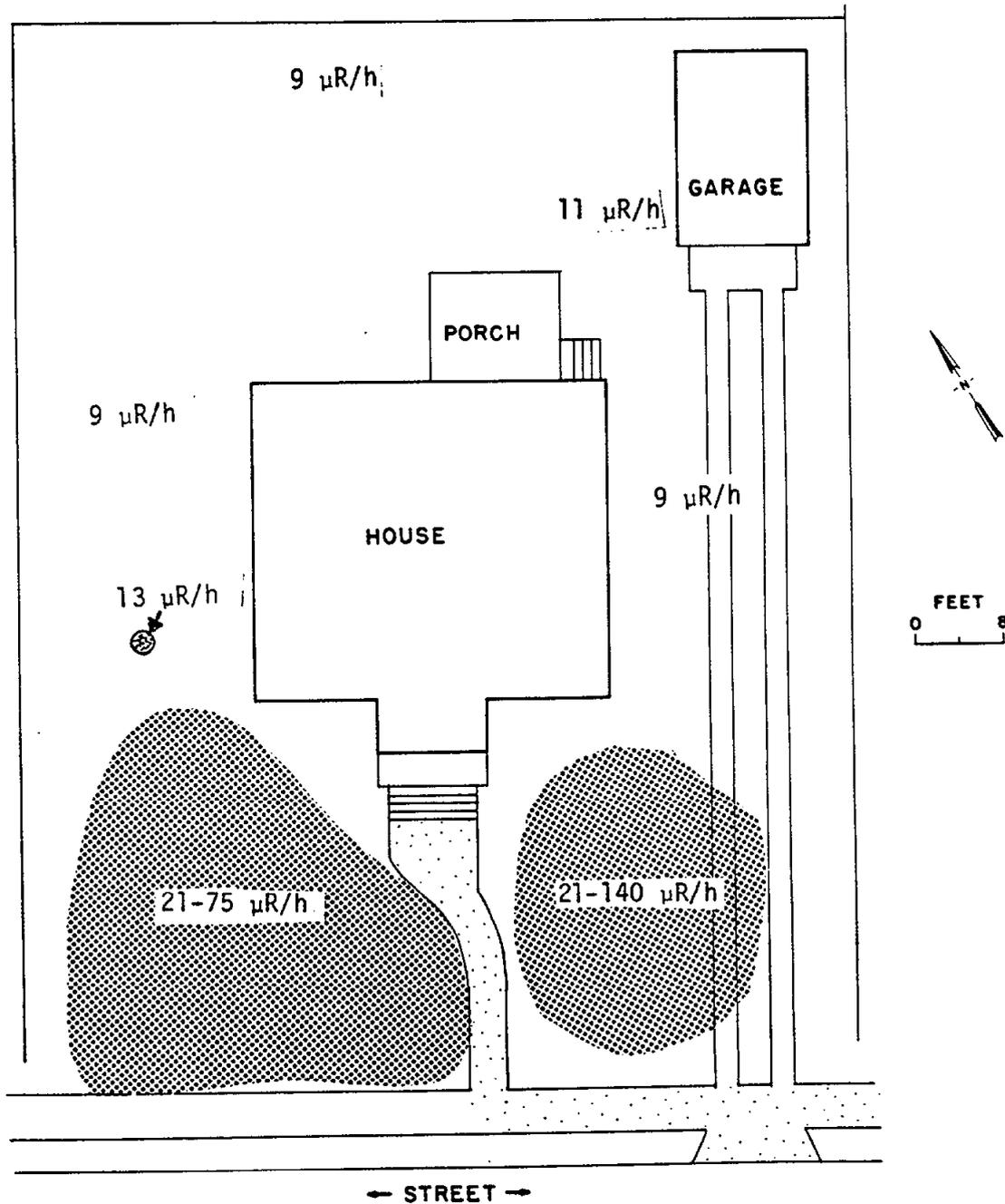


Fig. 2. Location of elevated gamma radiation levels at 59 Avenue C.

Table 1. A summary of proposed applicable radiation guidelines for the FUSRAP program (April 1984).

| Mode of exposure | Exposure conditions | Guideline value | Guideline source |
|--|--|---|--|
| 1. External gamma radiation | Continuous exposure to individual in general population (whole body) | 60 μ R/h | Nuclear Regulatory Commission (NRC) - Standards for Protection Against Radiation (10 CFR 20.105) |
| 2. Radionuclide concentrations in soil | Maximum permissible concentration of the following radionuclides in soil above background levels averaged over 100 m ² area | 5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over 15-cm thick soil layers more than 15 cm below the surface. | DOE Interim Residual Contamination and Waste Control Guidelines for FUSRAP and SFMP Sites (April 1984) |
| | ^{226}Ra ^{232}Th | | |

Table 2. Background radiation levels for the northern New Jersey area.

| Type or radiation measurement or sample | Radiation level or radionuclide concentration |
|---|--|
| Gamma exposure rate at 1 m above floor or ground surface ($\mu\text{R/h}$) | g ^a |
| Concentration of radionuclides in soil (pCi/g) | |
| 232Th | 0.9b |
| 238U | 0.9b |
| 226Ra | 0.9b |

^aReference 4.

^bReference 5.

Table 3. Results of soil sample analyses at property LJ006.

| Sample ^a | Depth (cm) | Radionuclide concentration (pCi/g) | | |
|-----------------------------------|---------------|------------------------------------|-------------------|-------------------------------|
| | | ²²⁶ Ra ^b | ²³² Th | ²³⁸ U ^c |
| <u>Systematic samples</u> | | | | |
| LJ6S1 | 0 - 10 | 0.92 ± 0.1 | 1.8 ± 0.6 | 0.87 |
| LJ6S2 | 0 - 15 | 0.67 ± 0.1 | 0.71 ± 0.5 | 0.57 |
| LJ6S3 | 0 - 15 | 0.77 ± 0.1 | 1.5 ± 0.4 | 0.73 |
| <u>Biased samples^d</u> | | | | |
| LJ6B1A | 0 - 10 | 14 ± 0.8 | 140 ± 30 | 7.0 |
| LJ6B1B | 10 - 20 | 7.3 ± 0.6 | 73 ± 20 | 4.4 |

^aLocations of soil samples are shown on Fig. 1.

^bIndicated counting error is at the 95% confidence level ($\pm 2 \sigma$).

^cTotal analytical error of measurement results is less than $\pm 3\%$ (95% confidence level).

^dBiased samples are taken from areas shown to have elevated gamma exposure rates.