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RESULTS OF THE RADIOLOGICAL SURVEY AT
12 CHARLES COURT (LJ018), LODI, NEW JERSEY

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HEALTH AND SAFETY RESEARCH DIVISION

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RESULTS OF THE RADIOLOGICAL SURVEY AT
12 CHARLES COURT (LJ018), LODI, NEW JERSEY

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Work performed as part of the
RADIOLOGICAL SURVEY ACTIVITIES PROGRAM

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RESULTS OF THE RADIOLOGICAL SURVEY AT
12 CHARLES COURT, LODI, NEW JERSEY

INTRODUCTION

A radiological survey of 12 Charles Court, Lodi, New Jersey, was conducted by a survey team from Oak Ridge National Laboratory (ORNL) on April 11, 1985 at the request of the Department of Energy (DOE). This property was identified as being suspected of having contaminated material present during the mobile gamma scan of Lodi, New Jersey.¹

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 has 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;

* 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.

background radiation levels have not been subtracted. Similarly, background 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 (LJ18S) and biased (LJ18B) samples are shown in Fig. 1, with results of laboratory analyses provided in Table 3. Concentrations of uranium, radium, and thorium were within normal background levels in the systematic samples. However, concentrations of uranium and radium in all biased soil samples exceeded the normal background levels for the northern New Jersey area. The range of ^{238}U and ^{226}Ra was 1.8 pCi/g to 32 pCi/g and 13 pCi/g to 100 pCi/g, respectively. Concentrations of ^{226}Ra exceeded those for ^{238}U in these samples, but it is believed to be naturally-occurring material. Concentrations of ^{232}Th in all biased soil samples are within normal background levels.

Gamma Radiation Levels

Results of the gamma scan of the surface of the property showed areas where gamma exposure rates are in excess of background radiation levels. Locations and exposure rates are shown in Fig. 2. These results locate areas where ^{238}U -bearing material exists. Gamma exposure rates up to 75 $\mu\text{R/h}$ exist on the surface of this property.

SUMMARY

Measurements taken at 12 Charles Court indicate that the property contains radioactive contamination primarily from the ^{238}U decay chain. This material was found in the locations shown in Fig. 2. While the ratios of ^{238}U to ^{226}Ra are not in total equilibrium, it is believed that this is naturally-occurring material. Further investigation may be required to determine if this uraniferous material is an outcrop of uranium ore material which is native to this area of northern New Jersey.

REFERENCES

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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).

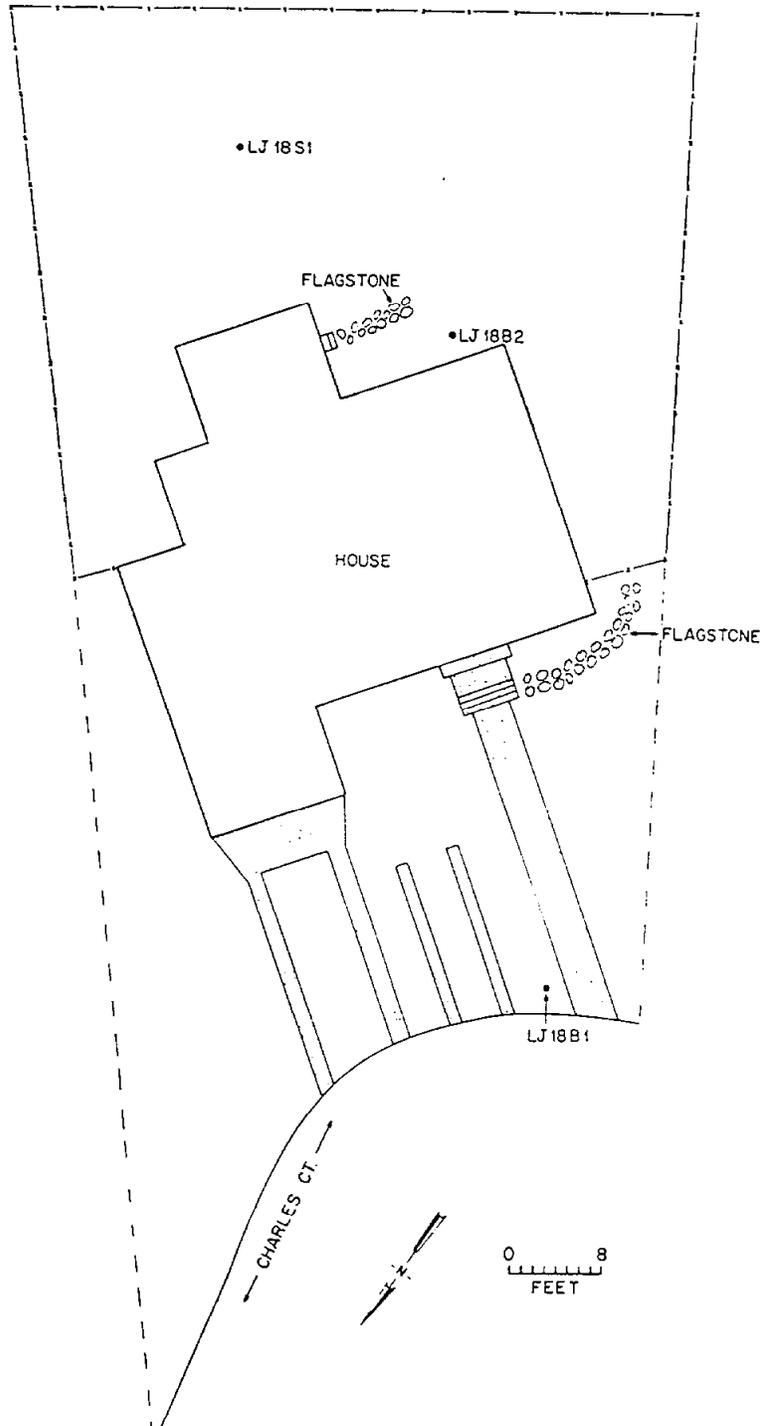


Fig. 1. Diagram showing locations of soil samples taken at 12 Charles Court, Lodi, New Jersey.

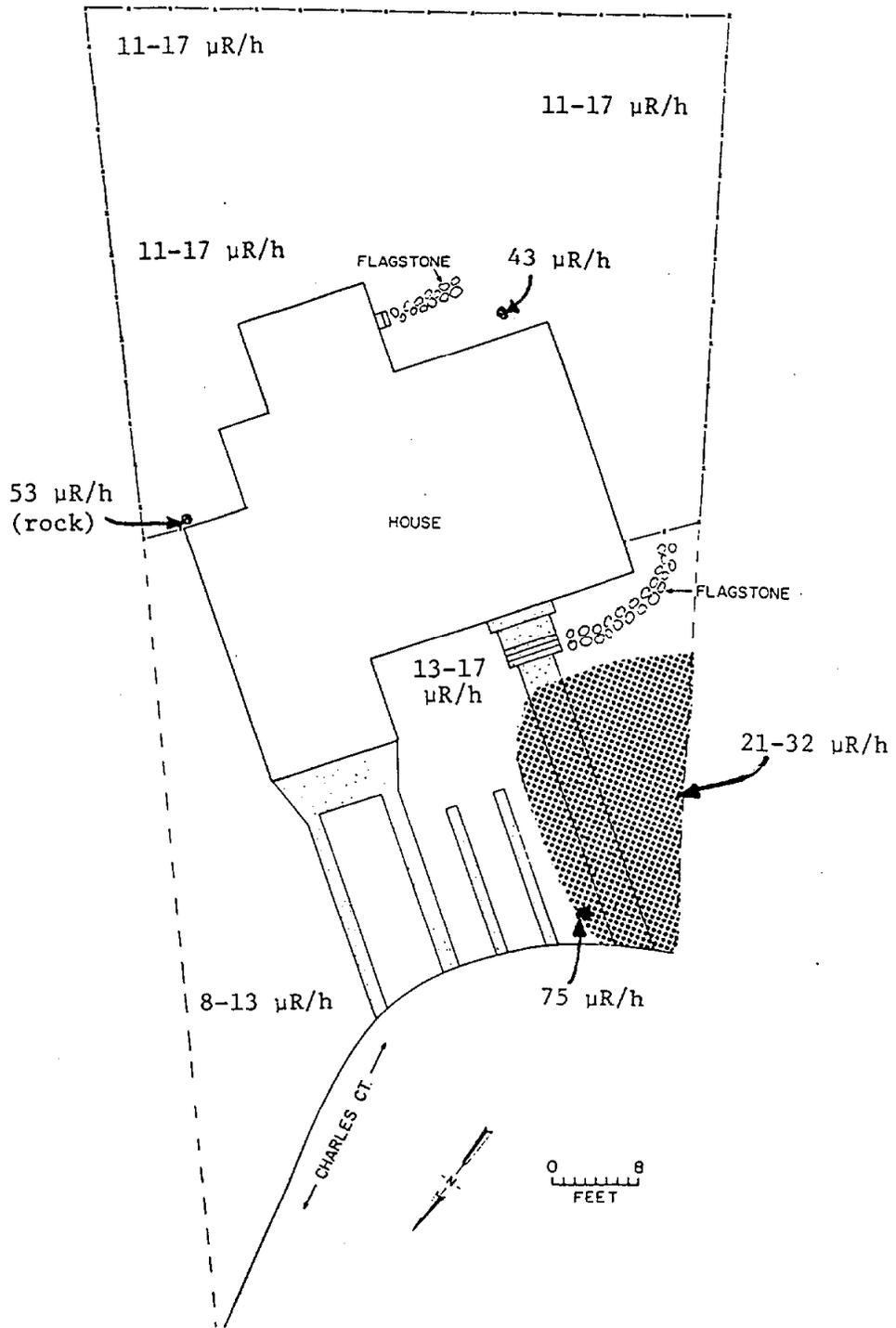


Fig. 2. Gamma radiation levels measured at 12 Charles Court, Lodi, New Jersey.

Table 1. A summary of applicable radiation guidelines for the FUSRAP program (July 1985).

Mode of exposure	Exposure conditions	Guideline value	Guideline source
1. Gamma radiation	Continuous exposure to individual in general population (whole body)	57 μ R/h	DOE Order 5480.1A Chapter 11 Requirements for Radiation Protection
2. Radionuclide concentrations in soil	Maximum permissible concentration of the following radionuclides in soil above background levels averaged over 100 m ² area ²²⁶ Ra ²³² Th	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 and less than 1.5 m below the surface	U.S. Department of Energy Guidelines for Residual Radioactivity at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites (Revision 1, July 1985)

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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 ($\mu\text{R}/\text{h}$)	8 ^a
Concentration of radionuclides in soil (pCi/g)	
²³² Th	0.9 ^b
²³⁸ U	0.9 ^b
²²⁶ Ra	0.9 ^b

^aReference 4.^bReference 5.

Table 3. Concentrations of radionuclides in soil at 12 Charles Court, Lodi, New Jersey.

Sample ^a	Depth (cm)	Radionuclide concentration (pCi/g)		
		²²⁶ Ra ^b	²³² Th ^b	²³⁸ U ^c
<u>Systematic samples</u>				
LJ18S1	0 - 15	1.1 ± 0.09	0.95 ± 0.3	0.92
<u>Biased samples^d</u>				
LJ18B1A	0 - 10	54 ± 1	1.3 ± 0.18	32
LJ18B1B	10 - 20	100 ± 2	<0.55	28
LJ18B2	20 - 30	13 ± 0.3	1.1 ± 0.5	1.8

^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 $\pm 5\%$ (95% confidence level).

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

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