M-659

Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the Maywood Site, New Jersey

US Army Corps of Engineers®

M-659

ORNL/RASA-88/22

HEALTH AND SAFETY RESEARCH DIVISION

Nuclear and Chemical Waste Programs
(Activity No. AH 10 05 00 0; ONLWCO1)

RESULTS OF THE RADIOLOGICAL SURVEY AT 136 WEST CENTRAL AVENUE (MJ030), MAYWOOD, NEW JERSEY

R. D. Foley, J. W. Crutcher, R. F. Carrier, and L. M. Floyd

Date of Issue – February 1989

Investigation Team

R. E. Swaja – Measurement Applications and Development Manager
W. D. Cottrell – FUSRAP Project Director
R.D. Foley – Field Survey Supervisor

Survey Team Members

A. C. Butler
P. F. Tiner
M. E. Ward*

*Stone Associates

Work performed by the
MEASUREMENT APPLICATIONS AND DEVELOPMENT GROUP

Prepared by the
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831-6285
operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U. S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-84OR21400

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

Research for this project was sponsored by the Division of Facility and Site Decommissioning Projects, U.S. Department of Energy, under Contract No. DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc. The authors wish to acknowledge the support of J. E. Baublitz, Deputy Director, Office of Remedial Action and Waste Technology; J. J. Fiore, Director, Division of Facility and Site Decommissioning Projects; and members of their staff. The authors also appreciate the contributions of B. C. Littleton and L. J. Jeffers of IR&A Publications Office, B. S. Ellis, D. A. Roberts, and T. R. Stewart of the Measurement Applications and Development Group, and M. E. Ward of Don Stone Associates for participation in the collection, analyses, and reporting of data for this survey.

RESULTS OF THE RADIOLOGICAL SURVEY AT 136 WEST CENTRAL AVENUE (MJ030), MAYWOOD, NEW JERSEY*

INTRODUCTION

From 1916 to 1956, process wastes and residues associated with the production and refining of thorium and thorium compounds from monazite ores were generated by the Maywood Chemical Works (MCW), Maywood, New Jersey. During the latter part of this period, MCW supplied rare earth metals and thorium compounds to various government agencies. In the 1940s and 1950s, MCW produced thorium and lithium, under contract, for the Atomic Energy Commission (AEC). These activities ceased in 1956, and approximately three years later, the 30-acre real estate was purchased by the Stepan Company. The property is located at 100 Hunter Avenue in a highly developed area in Maywood and Rochelle Park, Bergen County, New Jersey.

During the early years of operation, MCW stored wastes and residues in low-lying areas west of the processing facilities. In the early 1930s, these areas were separated from the rest of the property by the construction of New Jersey State Highway 17. The Stepan property, the interim storage facility, and several vicinity properties have been designated for remedial action by the Department of Energy (DOE).

The waste produced by the thorium extraction process was a sandlike material containing residual amounts of thorium and its decay products, with smaller quantities of uranium and its decay products. During the years 1928 and 1944 to 1946, area residents used these process wastes mixed with tea and cocoa leaves as mulch in their lawns and gardens. In addition, some of the contaminated wastes were apparently eroded from the site into Lodi Brook and carried downstream.

As a result of the Energy and Water Appropriations Act of Fiscal Year 1984, the property discussed in this report and properties in its vicinity contaminated with residues from the former MCW were included as a decontamination research and development project under the DOE Formerly Utilized Sites Remedial Action Program. As part of this project, DOE is conducting radiological surveys in the vicinity of the site to identify properties contaminated with residues derived from the MCW. The principal radionuclide of concern is thorium-232. The radiological survey discussed in this report is part of that effort and was conducted, at the request of DOE, by members of the Measurement Applications and Development Group of Oak Ridge National Laboratory.

A radiological survey of the private, residential property at 136 West Central Avenue, Maywood, New Jersey, was conducted during 1987. The survey and sampling of the ground surface and subsurface were carried out on April 29, 1987.

---

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

south end of the basement generally near or above the DOE guideline of 20 μR/h above background for indoor areas (Table 1).

Airborne Radon Progeny Concentrations

The results for ^{222}Rn decay products, converted to number of working levels (WL), show concentrations ranging from 0.008 to 0.0092 WL for the garage, the first-floor living room, and a second-floor bedroom. These values are well below the DOE guideline of 0.02 WL. However, concentrations of ^{222}Rn progeny were 0.048 and 0.058 WL for the south and north ends of the basement, respectively. These values exceed the DOE criterion for habitable structures (Table 1).

Alpha and Beta-Gamma Activity Levels

No beta activity was detected when measurements were taken with a G-M meter on the floor surface in the basement, and alpha activity levels were indistinguishable from background. Thus, surfaces in the basement are not contaminated.

Outdoor Survey Results

Surface Gamma Radiation Levels

Gamma radiation levels measured during a scan of the surface of the property are given in Fig. 1. Gamma exposure rates over the property ranged from 10 to 30 μR/h, with the 30 μR/h occurring at the rear of the property. Although the Maywood Interim Storage Site pile was not in direct line of sight at this location, it was evident that the elevated gamma was emanating from that source. Under certain conditions, extraneous radiation ("shine") emanating from a source outside the area of concern will affect measurements in that area. The source of the scattered radiation at this site is the large, heavily contaminated storage pile. To ensure that no contamination was present near the rear property line where surface measurements were affected by "shine," extensive soil sampling was performed (see Fig. 2).

Systematic and Biased Soil Samples

Eighteen systematic soil samples (S1A–S9B) and twenty-six biased soil samples (B1A–B2M) were taken for radionuclide analyses. The samples were taken at 15-cm increments from depths of 0 to 30 cm for the systematic samples and at varying increments from depths of 0 to 215 cm for the biased samples. Locations of the samples are shown in Fig. 2, with results of laboratory analyses provided in Table 3. Concentrations of ^{226}Ra and ^{232}Th in the systematic samples ranged from 0.76 to 2.9 pCi/g and from 1.1 to 3.6 pCi/g, respectively. In the biased samples, concentrations ranged from 0.73 to 1.4 pCi/g for ^{226}Ra and from 0.94 to 47 pCi/g for ^{232}Th. The DOE guideline for ^{232}Th concentration in subsurface soil is exceeded in three biased samples (B1I, B1J, and B2L). Radium-226 concentrations in both systematic and

REFERENCES

1. W. D. Cottrell, ORNL, to A. J. Whitman, DOE/HQ, correspondence, "Radiological Survey of Private Properties in Lodi, New Jersey" (August 15, 1984).

2. T. E. Myrick, B. A. Berven, W. D. Cottrell, W. A. Goldsmith, and F. F. Haywood, *Procedures Manual for the ORNL Radiological Survey Activities (RASA) Program,* Oak Ridge National Laboratory, ORNL/TM-8600 (April 1987).

3. U.S. Department of Energy, *Guidelines for Residual Radioactivity at Formerly Utilized Sites, Remedial Action Program and Remote Surplus Facilities Management Program Sites* (Rev. 2, March 1987).

4. 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).

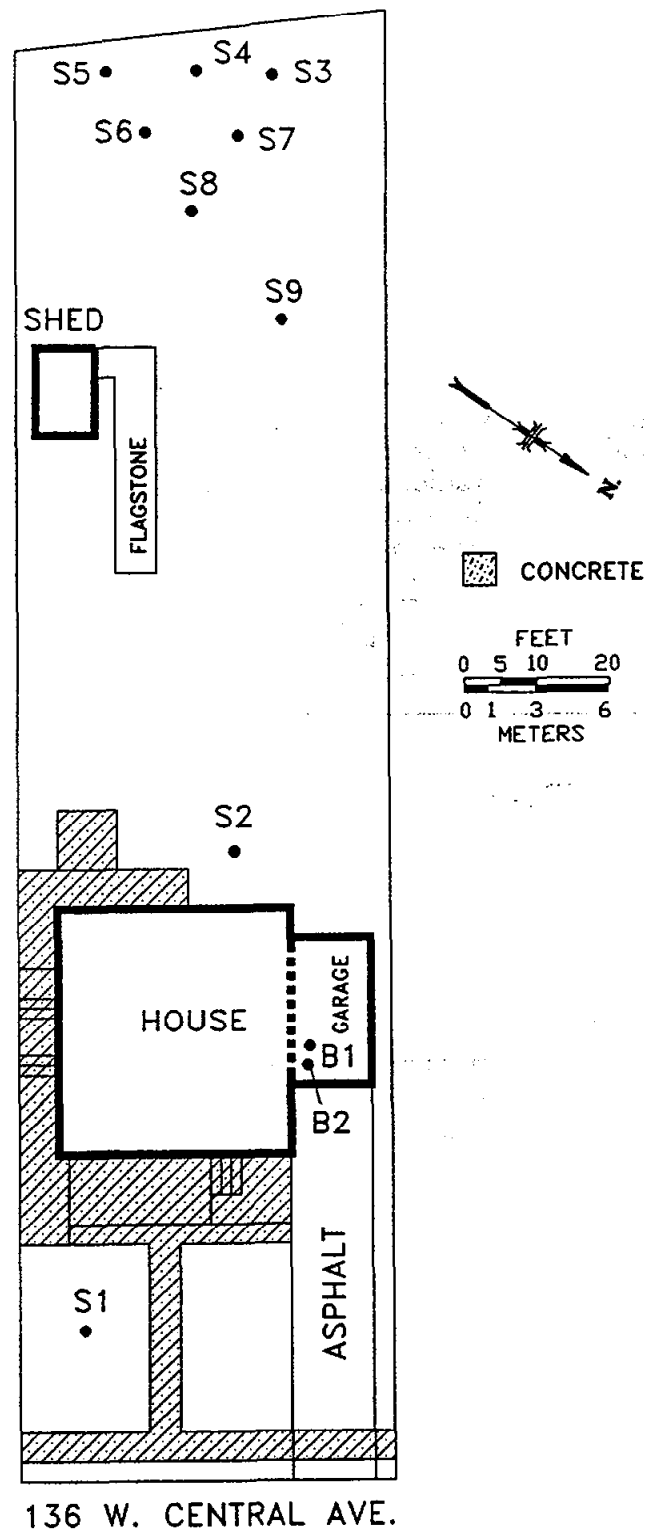

Fig. 2. Diagram showing locations of soil samples taken at 136 West Central Avenue, Maywood, New Jersey (MJ030).

Table 3. Concentrations of radionuclides in soil at 136 West Central Avenue, Maywood, New Jersey (MJ030)

Sample[a]	Depth (cm)	Radionuclide concentration (pCi/g)	
		^{226}Ra[b]	^{232}Th[b]
		Systematic samples[c]	
S1A	0–15	0.96 ± 0.08	1.4 ± 0.3
S1B	15–30	0.85 ± 0.1	1.3 ± 0.3
S2A	0–15	0.86 ± 0.07	1.3 ± 0.3
S2B	15–30	0.76 ± 0.2	1.2 ± 0.2
S3A	0–15	2.4 ± 0.1	2.9 ± 0.3
S3B	15–30	1.7 ± 0.08	2.0 ± 0.08
S4A	0–15	2.5 ± 0.1	3.1 ± 0.4
S4B	15–30	1.9 ± 0.04	2.0 ± 0.5
S5A	0–15	2.0 ± 0.2	2.4 ± 0.1
S5B	15–30	1.4 ± 0.2	1.7 ± 0.1
S6A	0–15	1.5 ± 0.06	2.1 ± 0.2
S6B	15–30	0.98 ± 0.05	1.5 ± 0.2
S7A	0–15	1.4 ± 0.2	2.0 ± 0.4
S7B	15–30	0.94 ± 0.1	1.1 ± 0.2
S8A	0–15	1.5 ± 0.1	3.4 ± 0.6
S8B	15–30	0.97 ± 0.1	1.7 ± 0.05
S9A	0–15	2.4 ± 0.2	3.3 ± 0.6
S9B	15–30	2.9 ± 0.1	3.6 ± 0.6
		Biased samples[d]	
B1A	0–15	0.73 ± 0.08	1.1 ± 0.2
B1B	15–30	0.74 ± 0.05	0.94 ± 0.06
B1C	30–45	0.78 ± 0.1	1.2 ± 0.1
B1D	45–75	0.78 ± 0.1	1.0 ± 0.3
B1E	75–90	0.81 ± 0.07	1.1 ± 0.3
B1F	90–105	0.95 ± 0.02	1.1 ± 0.04
B1G	105–120	1.2 ± 0.07	2.0 ± 0.09
B1H	120–135	1.1 ± 0.2	4.6 ± 0.3
B1I	135–150	1.4 ± 0.2	17 ± 0.4
B1J	150–165	1.0 ± 0.3	14 ± 1
B1K	165–185	0.81 ± 0.2	4.3 ± 0.2
B1L	185–195	0.75 ± 0.05	2.1 ± 0.08
B1M	195–215	0.89 ± 0.1	1.5 ± 0.3
B2A	0–15	0.84 ± 0.03	1.1 ± 0.09
B2B	15–30	0.88 ± 0.06	1.1 ± 0.2
B2C	30–45	0.81 ± 0.2	1.0 ± 0.3
B2D	45–60	0.84 ± 0.1	1.1 ± 0.3

INTERNAL DISTRIBUTION

1. B. A. Berven
2. R. F. Carrier
3. W. D. Cottrell
4. A. G. Croff
5. J. W. Crutcher
6. J. T. Ensminger
7–11. R. D. Foley
12. L. M. Floyd
13. S. V. Kaye
14. P. T. Owen
15–17. R. E. Swaja
18. J. K. Williams
19. IR&A Publications Office
20. Laboratory Records – RC

EXTERNAL DISTRIBUTION

21. J. D. Berger, Oak Ridge Associated Universities, P. O. Box 117, Oak Ridge, TN 37831
22. R. W. Doane, Eberline, Inc., 800 Oak Ridge Turnpike, Oak Ridge, TN 37831
23. J. J. Fiore, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874
24–26. P. J. Gross, U.S. Department of Energy, P. O. Box E, Oak Ridge, TN 37831
27–29. G. K. Hovey, Bechtel National, Inc., 800 Oak Ridge Turnpike, Oak Ridge, TN 37831
30. L. R. Levis, Roy F. Weston, Inc., 20030 Century Blvd., Germantown, MD 20874
31. G. P. Turi, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874
32. J. W. Wagoner, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874
33–35. Andrew Wallo III, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874
36. Office of Assistant Manager, Energy Research and Development, Oak Ridge Operations Office, Oak Ridge, TN 37831
37–38. Office of Scientific and Technical Information, DOE, Oak Ridge, TN 37831