

M-689

Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the Maywood Site, New Jersey



**US Army Corps
of Engineers®**

9
4
3
3
0
0

M-689 R. Atkin, OR



14

Department of Energy
Washington, DC 20545

EE05891

SEP 07 1988

[Redacted]
110 E. Hunter Avenue
Maywood, New Jersey 06707

Dear [Redacted]

As you know, the Department of Energy has completed a radiological survey of your property at 110 E. Hunter Avenue, Maywood, New Jersey. The purpose of the survey was to determine if your property warrants consideration for remedial action. We are pleased to inform you that the preliminary results from that survey indicate that radiological conditions on your property comply with Guidelines applicable to the Department's Maywood, New Jersey, remedial action project. As a result, no remedial action is required at your property.

The survey did identify some levels of radioactivity on your property that was higher than normal background for Northern New Jersey. It was primarily associated with naturally occurring radioactivity in cinders which typically contain concentrations of radionuclides greater than soil. One rock was found which contained relatively high concentrations. It was removed as part of a soil sample and no similar materials were found on the site. The rock appeared to contain natural isotopic concentrations of radionuclides and was not associated with the former Maywood Chemical Works operation.

A copy of the final survey report will be sent to you in the next few months by our radiological contractor, Oak Ridge National Laboratory. The file number for this survey is MJ022. If you have any questions on this survey or the letter or on the report when you receive it, please call Mr. Andrew Wallo of my staff at 301-353-5439.

Sincerely,

J. Fiore
James J. Fiore, Director
Division of Facility and Site
Decommissioning Projects
Office of Nuclear Energy

110091

U-689

ORNL/RASA-88/65

HEALTH AND SAFETY RESEARCH DIVISION

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

**RESULTS OF THE RADIOLOGICAL
SURVEY AT 110 E. HUNTER AVENUE,
MAYWOOD, NEW JERSEY (MJ022)**

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

Date Published - September 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
C. J. Miller*
P. F. Tiner
M. E. Ward†

*Oak Ridge Associated Universities
†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 DE-AC05-84OR21400

CONTENTS

LIST OF FIGURES	v
LIST OF TABLES	vii
ACKNOWLEDGMENTS	ix
ABSTRACT	xi
INTRODUCTION	1
SURVEY METHODS	2
SURVEY RESULTS	2
Surface Gamma Radiation Levels	2
Systematic and Biased Soil Samples	3
SIGNIFICANCE OF FINDINGS	3
REFERENCES	4

LIST OF FIGURES

- 1 Gamma radiation levels ($\mu\text{R/h}$) measured on the surface at
110 E. Hunter Avenue, Maywood, New Jersey (MJ022) 5
- 2 Diagram showing locations of soil samples taken at
110 E. Hunter Avenue, Maywood, New Jersey (MJ022) 6

LIST OF TABLES

1	Applicable guidelines for protection against radiation	7
2	Background radiation levels for the northern New Jersey area	7
3	Concentrations of selected radionuclides in soil at 110 E. Hunter Avenue, Maywood, New Jersey (MJ022)	8

ACKNOWLEDGMENTS

The U. S. Department of Energy's Division of Facility and Site Decommissioning Projects sponsored the research for this project under contract DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc. The authors wish to acknowledge the support of J. E. Baublitz, Acting Director, Office of Remedial Action and Waste Technology; J. J. Fiore, Director, Division of Facility and Site Decommissioning Projects; and members of their staffs. The authors also appreciate the contributions of A. C. Butler, D. A. Roberts, T. R. Stewart, and P. F. Tiner of the Measurement Applications and Development Group of the Health and Safety Research Division; R. L. Coleman of Don Stone Associates; and C. J. Miller of Oak Ridge Associated Universities.

ABSTRACT

Maywood Chemical Works (MCW) of Maywood, New Jersey, generated process wastes and residues associated with the production and refining of thorium and thorium compounds from monazite ores from 1916 to 1956. MCW supplied rare earth metals and thorium compounds to the Atomic Energy Commission and various other government agencies from the late 1940s to the mid-1950s. Area residents used the sandlike waste from this thorium extraction process mixed with tea and cocoa leaves as mulch in their yards. Some of these contaminated wastes were also eroded from the site into Lodi Brook. At the request of the U.S. Department of Energy (DOE), a group from Oak Ridge National Laboratory conducts investigative radiological surveys of properties in the vicinity of MCW to determine whether a property is contaminated with radioactive residues, principally ^{232}Th , derived from the MCW site. The survey typically includes direct measurement of gamma radiation levels and soil sampling for radionuclide analyses. The survey of this site, 110 E. Hunter Avenue, Maywood, New Jersey (MJ022), was conducted during 1987.

Following the removal of a small chunk of material showing elevated gamma exposure rates, all radionuclide concentrations and measurements conformed to DOE remedial action criteria. The slightly elevated radionuclide concentrations found in other soil samples were the result of naturally enhanced radioactivity characteristic of some environmental materials such as coal ash and were unrelated to operations at the MCW site. The survey data demonstrate that the property requires no further action on the part of DOE.

RESULTS OF THE RADIOLOGICAL SURVEY
AT 110 E. HUNTER AVENUE,
MAYWOOD, NEW JERSEY (MJ022)*

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 the Oak Ridge National Laboratory.

*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 U. S. DOE contract DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc.

A radiological survey of the commercial property at 110 E. Hunter Avenue, Maywood, New Jersey, was conducted during 1987. The survey and sampling of the ground surface, as well as the subsurface investigation, were carried out on April 22 and 23.

SURVEY METHODS

The radiological survey included a gamma scan of the entire property outdoors and the collection of surface and subsurface soil samples. No indoor survey measurements were performed. The survey methods followed the plan outlined in Reference 1. A comprehensive description of the survey methods and instrumentation has been presented in another report.²

Using a portable gamma scintillation meter, ranges of measurements were recorded for areas of the property surface. Systematic soil samples were obtained at randomly selected locations irrespective of gamma exposure rates. In addition, biased soil samples were collected at locations of elevated gamma levels.

SURVEY RESULTS

Applicable federal guidelines are summarized in Table 1.³ Normal background radiation levels for the northern New Jersey area are presented in Table 2. These data are provided for comparison with survey results presented in this section. All direct measurement results presented in this report are gross readings; background radiation levels have not been subtracted. Similarly, background concentrations have not been subtracted from radionuclide concentrations measured in environmental samples.

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 major portion of the property ranged from 5 to 12 $\mu\text{R/h}$. Slightly elevated levels of 14 and 15 $\mu\text{R/h}$ were measured in two of the open greenhouse areas. One significantly elevated measurement, 200 $\mu\text{R/h}$, was found at a localized spot in the asphalt parking lot north of Hunter Avenue. After removing a 2-in-thick layer of asphalt, the gamma level increased to 620 $\mu\text{R/h}$. A soil sample was taken and subdivided until a single "stone" was isolated as the primary source of the radiation. Two additional samples were taken down to a depth of 24 in. However, after removal of the first sample, all readings were in the range of background, indicating that the source of contamination had been removed in the first sample.

Systematic and Biased Soil Samples

Six systematic (S) and 17 biased (B) soil samples were taken from eight different locations on the property for radionuclide analyses. Sampling locations are shown in Fig. 2 with results of laboratory analyses provided in Table 3. Concentrations of radium and thorium in the systematic samples ranged from 0.73 to 0.87 pCi/g and 0.76 to 1.0 pCi/g, respectively. These values are comparable to background concentrations typically encountered in the northern New Jersey area (Table 2). Concentrations of radium and thorium in the biased samples ranged from 0.78 to 410 pCi/g and 0.89 to 15 pCi/g, respectively. The maximum concentrations of ^{226}Ra and ^{232}Th , 410 and 15 pCi/g, respectively, were found in soil sample B3A. Sample B3A was taken from a depth of 0–15 cm beneath the asphalt surface and contained the chunk of material displaying the maximum gamma radiation levels found on the property. All biased sampling locations, including B3, contained what appeared to be coal ashes. Other than sample B3A, the analysis results were consistent with other samples containing ash that had been collected in the Maywood/Lodi area. The slight elevation in radionuclide concentration in coal ash is due to the naturally occurring radioactive elements in coal.

SIGNIFICANCE OF FINDINGS

Some radiological measurements taken at 110 E. Hunter Avenue were greater than background levels typically encountered in the northern New Jersey area. However, following removal of sample B3A (the chunk of material responsible for the elevated gamma levels) no radiation measurements nor radionuclide concentrations exceeded the applicable DOE criteria. The slightly elevated radionuclide concentrations found in other soil samples were probably associated with naturally enhanced radioactivity characteristic of some environmental materials (i.e., coal ash). They are not the result of residuals from operations at the MCW site.

In any case, the data demonstrate that the radiological condition of this property conforms to DOE guidelines and that, therefore, it does not warrant consideration for inclusion in the DOE remedial action program.

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).

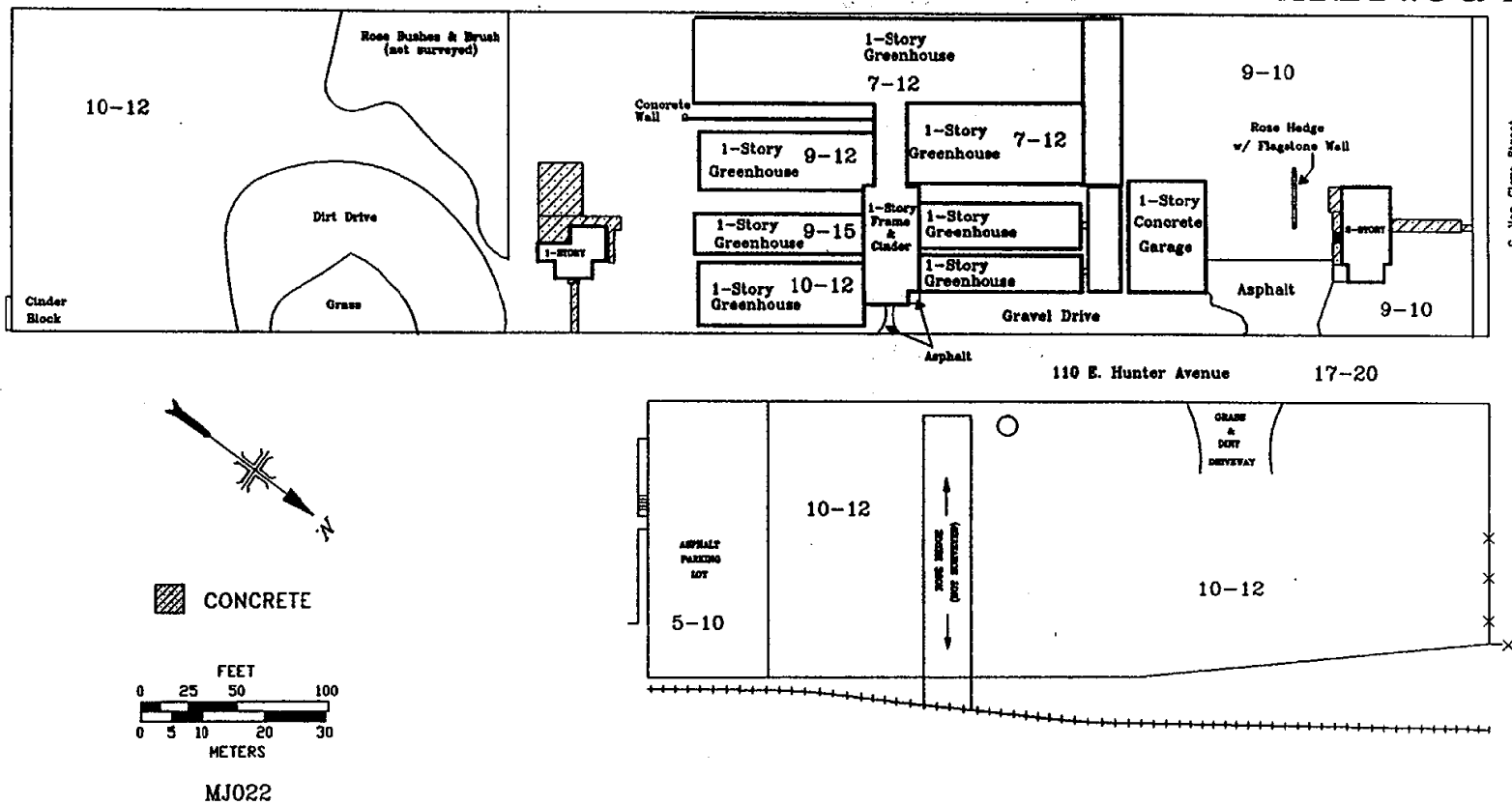


Fig. 1. Gamma radiation levels ($\mu\text{R/h}$) measured on the surface at 110 E. Hunter Avenue, Maywood, New Jersey (MJ022).

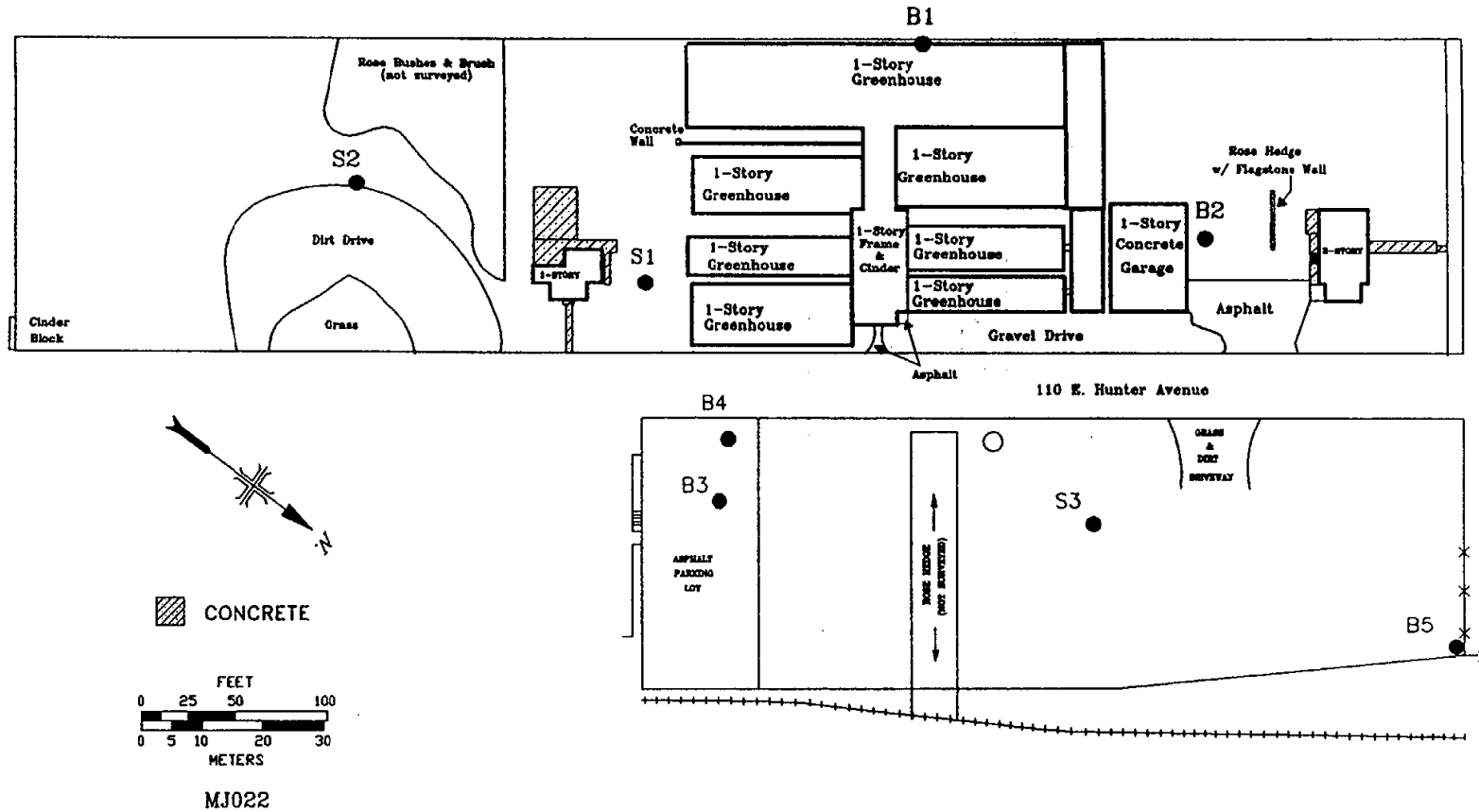


Fig. 2. Diagram showing locations of soil samples taken at 110 E. Hunter Avenue, Maywood, New Jersey (MJ022).

Table 1. Applicable guidelines for protection against radiation^a

Mode of exposure	Exposure conditions	Guideline value
Radionuclide concentrations in soil	Maximum permissible concentration of the following radionuclides in soil above background levels averaged over a 100 m ² area ²³² Th ²³⁰ Th ²²⁸ Ra ²²⁶ Ra	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

^aU. 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).

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

Type of sample	Radionuclide concentration
Concentration of radionuclides in soil (pCi/g) ^a	
¹³⁷ Cs	0.9
²²⁶ Ra	0.9
²³⁸ U	0.9

^aReference 4.

Table 3. Concentrations of radionuclides in soil at 110 E. Hunter Avenue, Maywood, New Jersey (MJ022)

Sample ^a	Depth (cm)	Radionuclide concentration (pCi/g)	
		²²⁶ Ra ^b	²³² Th ^b
<i>Systematic samples</i>			
S1A	0-15	0.87 ± 0.05	0.82 ± 0.05
S1B	15-30	0.85 ± 0.2	0.94 ± 0.2
S2A	0-15	0.73 ± 0.1	0.97 ± 0.1
S2B	15-30	0.77 ± 0.07	0.76 ± 0.2
S3A	0-15	0.82 ± 0.09	1.0 ± 0.2
S3B	15-30	0.85 ± 0.07	1.0 ± 0.09
<i>Biased samples^c</i>			
B1A	0-5	2.7 ± 0.03	3.1 ± 0.5
B1B	5-15	1.8 ± 0.4	2.4 ± 0.4
B2A	0-5	1.5 ± 0.1	1.6 ± 0.3
B2B	5-15	1.6 ± 0.09	1.7 ± 0.3
B2C	15-30	1.0 ± 0.2	1.2 ± 0.1
B3A	0-15	410 ± 30	15 ± 0.9
B3B	15-30	1.7 ± 0.2	1.9 ± 0.3
B3C	30-45	0.90 ± 0.2	0.90 ± 0.4
B4A	0-15	1.7 ± 0.4	1.2 ± 0.2
B4B	15-30	0.93 ± 0.06	0.89 ± 0.4
B4C	30-45	0.81 ± 0.2	0.97 ± 0.08
B4D	45-60	0.78 ± 0.02	0.93 ± 0.04
B4E	60-75	0.81 ± 0.07	1.1 ± 0.2
B5A	0-5	3.3 ± 0.2	3.7 ± 0.1
B5B	5-15	2.1 ± 0.3	2.3 ± 0.4
B5C	15-30	1.1 ± 0.1	1.2 ± 0.4
B5D	30-45	1.0 ± 0.05	1.2 ± 0.2

^aLocations of soil samples are shown on Fig. 2.

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

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

INTERNAL DISTRIBUTION

- | | |
|-------------------|------------------------------|
| 1. B. A. Berven | 13. P. Y. Lu |
| 2. R. F. Carrier | 14. P. T. Owen |
| 3. W. D. Cottrell | 15-17. R. E. Swaja |
| 4. A. G. Croff | 18. J. K. Williams |
| 5. J. W. Crutcher | 19. Central Research Library |
| 6. L. M. Floyd | 20. IR&A Publications Office |
| 7-11. R. D. Foley | 21. Laboratory Records - RC |
| 12. S. V. Kaye | 22. Y-12 Technical Library |

EXTERNAL DISTRIBUTION

23. J. D. Berger, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831
24. R. W. Doane, Eberline, Inc., 800 Oak Ridge Turnpike, P.O. Box 350, Oak Ridge, Tn 37831
25. J. J. Fiore, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874
- 26-28. G. K. Hovey, Bechtel National, Inc., 800 Oak Ridge Turnpike, P.O. Box 350, Oak Ridge, TN 37831
29. L. R. Levis, Roy F. Weston, Inc., 20030 Century Blvd., Germantown, MD 20874
30. G. P. Turi, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874
31. J. W. Wagoner, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874
- 32-34. Andrew Wallo III, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874
35. Office of Assistant Manager, Energy Research and Development, Oak Ridge Operations Office, P.O. Box 2001, Oak Ridge, TN 37831-8600
- 36-37. Office of Scientific and Technical Information, DOE, P.O. Box 62, Oak Ridge, TN 37831