

# ornl

ORNL/RASA-95/3

**OAK RIDGE  
NATIONAL  
LABORATORY**

**MARTIN MARIETTA**

**Radiological Verification Survey  
Results at 14 Peck Ave.,  
Pequannock, New Jersey  
(PJ001V)**

R. E. Rodriguez  
C. A. Johnson

MANAGED BY  
MARTIN MARIETTA ENERGY SYSTEMS, INC.  
FOR THE UNITED STATES  
DEPARTMENT OF ENERGY

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

**RECEIVED**

**JUN 29 1995**

**OSTI**

PT

This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from (615) 576-8401, FTS 626-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

## **DISCLAIMER**

**Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.**

HEALTH SCIENCES RESEARCH DIVISION  
Environmental Restoration and Waste Management Non-Defense Programs  
(Activity No. EX 20 20 01 0; ADS317AEX))

**Radiological Verification Survey Results  
at 14 Peck Ave.,  
Pequannock, New Jersey (PJ001V)**

R. E. Rodriguez and C. A. Johnson

Date issued —May 1995

Investigation Team

R. D. Foley — Measurement Applications and Development Manager  
R. E. Rodriguez— Survey Team Leader

Survey Team Members

R. E. Rodriguez	D. E. Rice
V. P. Patania	P. F. Tiner
A. C. Butler*	W. H. Shinpaugh*

\*Midwest Technical, Inc.

Work performed by the  
Measurement Applications and Development Group  
Prepared by the  
OAK RIDGE NATIONAL LABORATORY  
Oak Ridge, Tennessee 37831-6285  
managed by  
LOCKHEED MARTIN ENERGY SYSTEMS, INC.  
for the  
U. S. DEPARTMENT OF ENERGY  
under contract DE-AC05-84OR21400

**MASTER**



## CONTENTS

LIST OF FIGURES.....	v
LIST OF TABLES.....	vii
ACKNOWLEDGMENTS.....	ix
ABSTRACT.....	xi
INTRODUCTION.....	1
SCOPE OF THE SURVEY.....	1
VERIFICATION SURVEY AND ANALYSIS.....	2
CONCLUSIONS.....	3



## LIST OF FIGURES

- |   |   |   |
|---|---|---|
| 1 | Diagram showing general location of the Wayne Interim Storage Site (WISS) relative to the Wayne and Pequannock, New Jersey vicinity properties..... | 4 |
| 2 | Diagram of the property at 14 Peck Ave., Pequannock, New Jersey showing soil sampling locations and gamma measurements.....                         | 5 |





## LIST OF TABLES

1	Concentrations of radionuclides in soil at 14 Peck Ave., Pequannock, New Jersey (PJ001V).....	6
---	--	---



## ACKNOWLEDGMENTS

Research for this project was sponsored by the Office of Environmental Restoration, U. S. Department of Energy, under contract DE-AC05-84OR21400 with Lockheed Martin Energy Systems, Inc. The authors wish to acknowledge the contributions of V. P. Patania, D. A. Roberts, D. A. Rose, and J. M. Lovegrove of the Measurement Applications and Development Group for participation in the sample preparation and analyses, editing, graphics, and reporting of data for this survey. The surveying assistance of the staff on the survey team is also gratefully acknowledged.



## ABSTRACT

The U. S. Department of Energy (DOE) conducted remedial action during 1993 at the Pompton Plains Railroad Spur and eight vicinity properties in the Wayne and Pequannock Townships in New Jersey as part of the Formerly Utilized Sites Remedial Action Program (FUSRAP). These properties are in the vicinity of the DOE-owned Wayne Interim Storage Site (WISS), formerly the W. R. Grace facility. The property at 14 Peck Ave., Pequannock, New Jersey is one of these vicinity properties.

At the request of DOE, a team from Oak Ridge National Laboratory conducted an independent radiological verification survey at this property. The purpose of the survey, conducted between September and December 1993, was to confirm the success of the remedial actions performed to remove any radioactive materials in excess of the identified guidelines. The verification survey included surface gamma scans and gamma readings at 1 meter, beta-gamma scans, and the collection of soil and debris samples for radionuclide analysis.

Results of the survey demonstrated that all radiological measurements on the property at 14 Peck Ave. were within applicable DOE guidelines. Based on the results of the remedial action data and confirmed by the verification survey data, the portions of the site that had been remediated during this action successfully meet the DOE remedial action objectives.

# RADIOLOGICAL VERIFICATION SURVEY RESULTS AT 14 PECK AVE., PEQUANNOCK, NEW JERSEY (PJ001V)\*

## INTRODUCTION

As part of the Formerly Utilized Sites Remedial Action Program (FUSRAP), the Department of Energy (DOE) conducted a remedial action project in 1993 at several residential vicinity properties in the Townships of Pequannock and Wayne, New Jersey. Figure 1 shows the general location of these vicinity properties.

From September to December 1993, a team from the Measurements Application and Development Group, Oak Ridge National Laboratory (ORNL), conducted radiological verification surveys of these properties in the Wayne and Pequannock, New Jersey areas. The property at 14 Peck Ave., Pequannock, was one of the properties that had previously been surveyed and designated for remedial action. After completion of the remediation, the team from ORNL conducted a radiological verification survey of this property at the request of DOE. The verification survey consisted primarily of a complete gamma scan of the grounds and the collection of soil samples for radionuclide analysis.

This report describes the radiological verification survey of the private residential property at 14 Peck Ave., Pequannock, New Jersey, conducted by ORNL at the request of the Department of Energy's Office of Environmental Restoration.

The property at 14 Peck Ave., is a single family dwelling with blacktop driveway in front of the house (see Fig. 2).

A walkover survey of the property (a technician walks slowly over the property swinging a detection probe at ~1-2 inches from the ground surface) was conducted in October and November 1993 by ORNL's Measurement Applications and Development Group. The purpose of the survey, which included the remediated area in the front yard, was to determine whether any radiological residues above guidelines remained on the property.

A field survey drawing showing 10-m grids and indicating soil sampling locations and gamma radiation measurements is included in this report as Fig. 2.

## SCOPE OF THE SURVEY

A comprehensive description of the survey methods and instrumentation used in this survey is given in *Procedures Manual for the ORNL Radiological Survey Activities (RASA) Program*, ORNL/TM-8600 (April 1987), and *Measurement Applications and Development Group Guidelines*, ORNL-6782 (January 1995).

The radiological survey of this property included: (1) a surface gamma scan of the grounds, sidewalks, and driveway, and (2) the collection of surface soil samples for analysis.

---

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

Gamma radiation levels were determined using a portable sodium iodide (NaI) gamma scintillation detector connected to a Victoreen ratemeter. Measurements were recorded and converted to  $\mu\text{R}/\text{h}$ . Because NaI gamma scintillators are energy dependent, measurements of gamma radiation levels in counts per minute (CPM) are normalized to pressurized ionization chamber (PIC) measurements to estimate gamma exposure rates in  $\mu\text{R}/\text{h}$ .

Surface (0-15 cm, or 0 to 6 in) soil samples were collected randomly over the property. Confirmatory samples were taken from the remediated area next to the driveway on the front (north side) of the house where slightly elevated gamma levels had been identified. These are referred to as biased samples and are labeled as B1 and B2. Systematic samples (S1-S3) were taken at locations irrespective of gamma exposure rates. Locations of the samples are shown in Fig. 2, and results of the analysis are shown in Table 1.

Direct measurement results presented in this report are gross readings; background radiation levels have not been subtracted. Similarly, background radiation levels have not been subtracted from radionuclide concentrations measured in environmental samples.

## VERIFICATION SURVEY AND ANALYSIS

Gamma measurements at one meter from the surface ranged from 9 to 10  $\mu\text{R}/\text{h}$  as shown in Fig. 2.

Surface gamma measurements generally ranged from 10 to 12  $\mu\text{R}/\text{h}$  in the grassy areas of the front and back yards, and up to 21  $\mu\text{R}/\text{h}$  at the surface of the remediated area next to the asphalt drive. All of these measurements are comparable to the natural background levels for this area.

Surface soil samples were collected from the front and back yards of the property, including two biased samples taken from the remediated part of the lawn next to the driveway. All samples were analyzed for radium ( $^{226}\text{Ra}$ ), thorium ( $^{232}\text{Th}$ ), and uranium ( $^{238}\text{U}$ ).

Results of the soil analyses are in picocuries per gram (pCi/g) and are shown in Table 1. Radionuclide concentrations of  $^{226}\text{Ra}$  and  $^{232}\text{Th}$  ranged from 0.52 to 1.03 pCi/g and from 1.03 to 4.06 pCi/g, respectively, in both biased and systematic samples. These values are well below the DOE guideline for these radionuclides in soil which is 5 and 15 pCi/g above background averaged over 100 m<sup>2</sup> for surface and subsurface soil, respectively.\*

---

\* For residential properties in this area, the guideline for  $^{232}\text{Th}$  is 5 pCi/g for both surface and subsurface soil.



Concentrations of  $^{238}\text{U}$  in soil ranged from 0.54 to 1.6 pCi/g in systematic and biased samples. These values are well below the site specific guidelines for uranium in soil.\*\*

## CONCLUSIONS

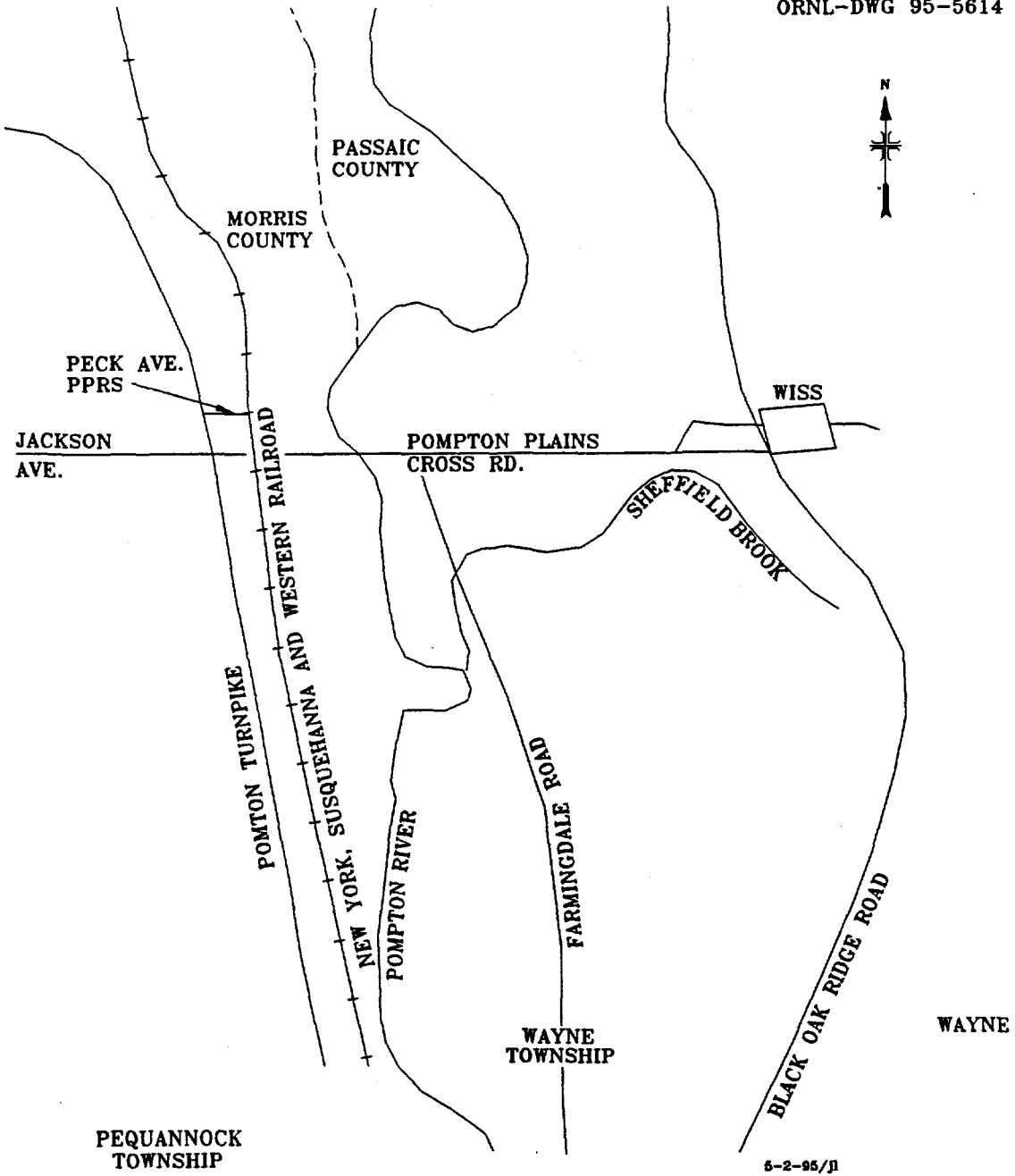
Generally, gamma measurements on the property at 14 Peck Ave., Pequannock, New Jersey were comparable to the average values for the area. Although slightly elevated gamma measurements were detected in the remediated area in the front yard next to the driveway, they were within the range of background levels.

The previously remediated area was thoroughly investigated for radionuclide residues. The results of soil radionuclide analysis for  $^{238}\text{U}$ ,  $^{226}\text{Ra}$ , and  $^{232}\text{Th}$  indicate that all soil concentration measurements are within the limits prescribed by DOE radiological guidelines.

Based on the results of the remedial action data and confirmed by the verification survey data, all radiological measurements fall below the limits prescribed by DOE radiological guidelines established for this site. It is concluded that the portions of the site which had been remediated during this action successfully meet the DOE remedial action objectives.

---

\*\* DOE guidelines for uranium are derived on a site-specific basis. Guidelines of 100 pCi/g have been applied to this FUSRAP site. Source: Memo, J. W. Wagoner II, Director, Division of Off-Site Programs, Office of Environmental Restoration, U. S. Department of Energy, to L. K. Price, Director, Former Sites Restoration Division, Oak Ridge Field Office, U. S. DOE, April 25, 1995.



**Fig. 1. Diagram showing general location of the Wayne Interim Storage Site (WISS) relative to the Wayne and Pequannock, New Jersey vicinity properties.**

ORNL-DWG 95-5594

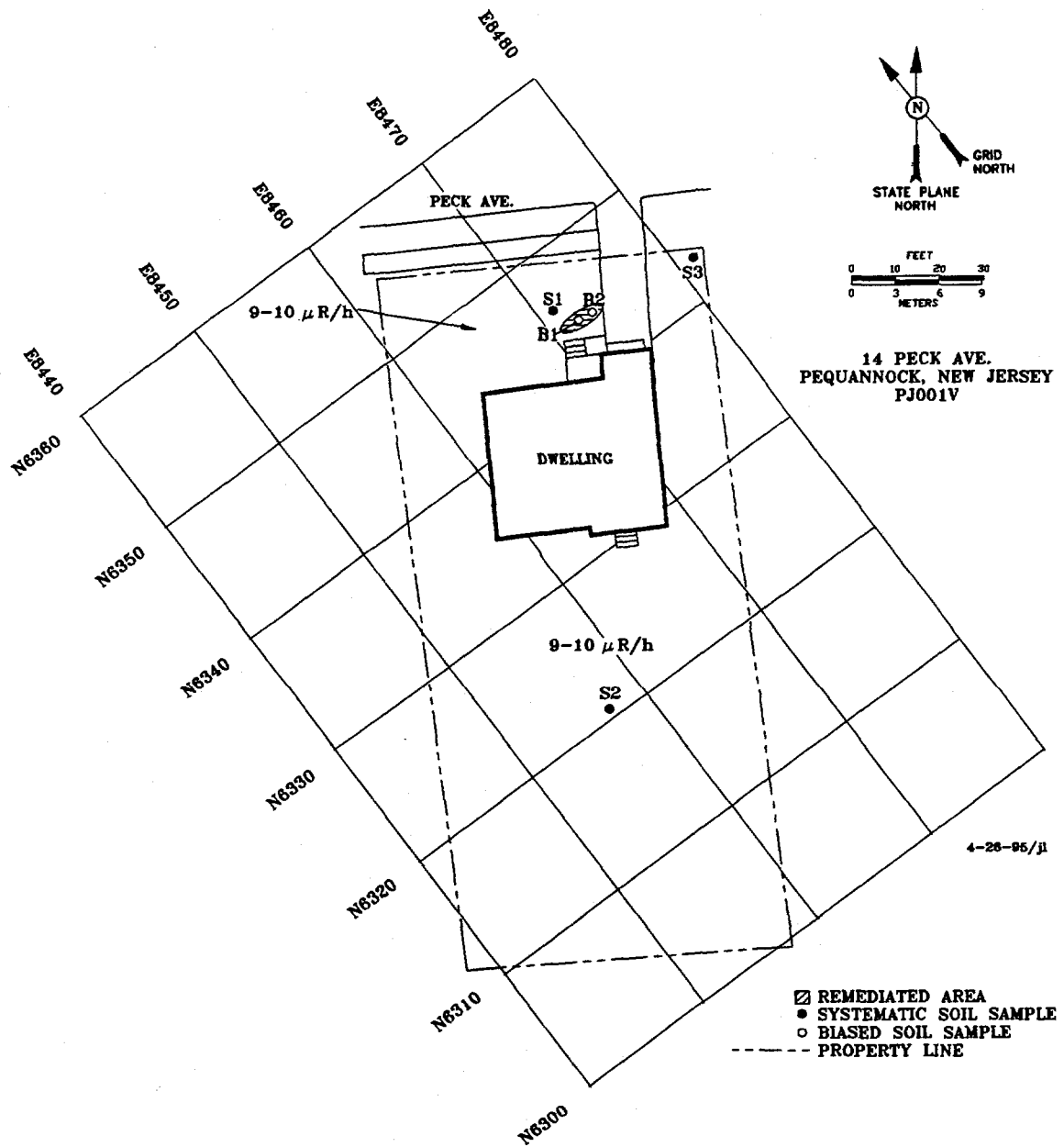


Fig. 2. Diagram of the property at 14 Peck Ave., Pequanock, New Jersey showing soil sampling locations and gamma measurements.

**Table 1. Concentrations of radionuclides in soil  
at 14 Peck Ave., Pequannock, New Jersey (PJ001V)**

Sample number <sup>a</sup>	Grid location	Depth (cm)	Radionuclide concentration (pCi/g) <sup>b</sup>		
			<sup>226</sup> Ra	<sup>232</sup> Th	<sup>238</sup> U
<i>Systematic samples<sup>c</sup></i>					
S1	6345N,8470E	0-15	0.84 ±0.1	1.04 ±0.1	0.54±0.4
S2	6321N,8456E	0-15	0.63 ±0.1	1.03 ±0.1	0.58±0.4
S3	6343N,8480E	0-15	0.7 ±0.1	1.09 ±0.1	1.3 ±0.4
<i>Biased samples<sup>d</sup></i>					
B1	6344N,8471E	0-8	1.03 ±0.1	4.06±0.2	1.6 ±0.3
B2	6344N,8472E	0-5	0.52 ±0.1	1.4 ±0.2	0.90±0.3

<sup>a</sup>Locations of soil samples are shown on Fig. 2.

<sup>b</sup>Indicated counting error is at the 95% confidence level ( $\pm 2\sigma$ ).

<sup>c</sup>Systematic samples are taken at locations irrespective of gamma exposure rates.

<sup>d</sup>Biased samples are taken from areas with elevated gamma exposure rates.

## INTERNAL DISTRIBUTION

- |                        |                                  |
|------------------------|----------------------------------|
| 1. B. A. Berven        | 13. R. E. Swaja                  |
| 2. K. J. Brown         | 14. M. S. Uziel                  |
| 3. R. F. Carrier       | 15. J. K. Williams               |
| 4. R. D. Foley         | 16. Central Research Library     |
| 5-7. C. A. Johnson     | 17-18. Laboratory Records        |
| 8. M. E. Murray        | 19. Laboratory Records-RC        |
| 9. P. T. Owen          | 20. ORNL Patent Section          |
| 10-12. R. E. Rodriguez | 21. ORNL Technical Library, Y-12 |
|                        | 22-27. MAD Records Center        |

## EXTERNAL DISTRIBUTION

- 28. W. L. Beck, Oak Ridge Associated Universities, E/SH Division, Environmental Survey and Site Assessment Program, P.O. Box 117, Oak Ridge, TN 37831-0117
- 29. Jack Russell, Booz-Allen & Hamilton, Inc., Trevion I Bldg., Suite 210, 12850 Middlebrook Rd., Bethesda, MD 20814
- 30. James J. Fiore, Director, Office of Eastern Area Programs, Office of Environmental Restoration, EM-24, U.S. Department of Energy, 19901 Germantown Rd., Germantown, MD 20874-1290
- 31-33. R. R. Harbert, Bechtel National, Inc., FUSRAP Department, Oak Ridge Corporate Center, 151 Lafayette Drive, P.O. Box 350, Oak Ridge, TN 37831-0350
- 34-36. J. King, Science Applications International Corporation, P.O. Box 2501, 301 Laboratory Road, Oak Ridge, TN 37831
- 37. L. K. Price, Director, Former Sites Restoration Division, Oak Ridge Field Office, U.S. Department of Energy, P.O. Box 2001, Oak Ridge, TN 37831-8723
- 38. James W. Wagoner II, Director, Division of Off-Site Programs, Office of Eastern Area Programs, Office of Environmental Restoration, EM-421, U.S. Department of Energy, 19901 Germantown Rd., Germantown, MD 20874-1290
- 39-43. W. Alexander Williams, Designation and Certification Manager, Division of Off-Site Programs, Office of Eastern Area Programs, Office of Environmental Restoration, EM-421, U.S. Department of Energy, 19901 Germantown Rd., Germantown, MD 20874-1290
- 44-45. Office of Scientific and Technical Information, U.S. Department of Energy, P.O. Box 62, Oak Ridge, TN 37831
- 46. Office of Assistant Manager, Energy Research and Development, U.S. Department of Energy, DOE Field Office, P.O.Box 2008, Oak Ridge, TN 37831-6269