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Radiological Verification Survey Results at 17 Peck Ave., Pequannock, New Jersey (PJ006V)

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Radiological Verification Survey Results at 17 Peck Ave., Pequannock, New Jersey (PJ006V)

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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 17 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 17 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 17 PECK AVE., PEQUANNOCK, NEW JERSEY (PJ006V)*

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 17 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 17 Peck Ave., Pequannock, New Jersey, conducted by ORNL at the request of the Department of Energy's Office of Environmental Restoration.

The property at 17 Peck Ave., Pequannock, New Jersey is a single family dwelling with asphalt driveway and attached garage (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 areas in the front yard and driveway, 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 verification survey of this property included: (1) a surface gamma scan of the grounds, sidewalks, and driveway, and (2) the collection of surface and subsurface soil samples for analysis.

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* 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 μR/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 μR/h.

Surface (0-15 cm, or 0 to 6 in) and subsurface (15-30 cm, or 6 to 12 in) soil samples were collected at various locations over the property. Confirmatory samples were taken from the remediated areas and are referred to as biased samples, labeled B1 through B9. Systematic samples (S1-S7) were taken at random irrespective of gamma exposure rates. Locations of the samples are shown in Fig. 2, and results of the radionuclide 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 10 to 13 μR/h over all the property as shown on Fig 2. Gamma measurements generally ranged from 18 to 25 μR/h at surface contact in the remediated areas in the front and back yards. These measurements are comparable to the natural background gamma levels for this area.

Surface and subsurface soil samples were collected randomly over the entire property, including biased samples taken from the remediated areas in the front and back yards. All samples were analyzed for radium (^{226}Ra), thorium (^{232}Th), and uranium (^{238}U).

Results of the soil analyses are in picocuries per gram (pCi/g) and are shown in Table 1. Radionuclide concentrations of ^{226}Ra (including surface and subsurface soil) in both systematic and biased samples ranged from 0.53 to 1.9 pCi/g. Concentrations of ^{232}Th in systematic and biased samples ranged from 0.96 to 3 pCi/g. These values are all below the DOE guideline for these radionuclides in soil which is 5 and 15 pCi/g above background averaged over 100 m^2 for surface and subsurface soil, respectively.* One sample, B9A, which contained 10 pCi/g of ^{232}Th, was taken outside the remediated area in a small (<1 m^2) spot showing slightly elevated gamma levels (see Fig. 2). However, any contamination in this small area was completely removed in the sample. There were no elevated gamma radiation levels in this area after sampling.

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

Concentrations of ^{238}U in soil ranged from 0.46 to 2.9 pCi/g in both systematic and biased samples. These values are well below the site specific guidelines for uranium in soil.**

CONCLUSIONS

Gamma measurements on the property at 17 Peck Ave., Pequannock, N. J. were comparable to the average values for the area. The previously remediated areas in the front and back yards of the property were thoroughly investigated for radionuclide residues. The results of soil radionuclide analysis for ^{238}U, ^{226}Ra, and ^{232}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 that 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.

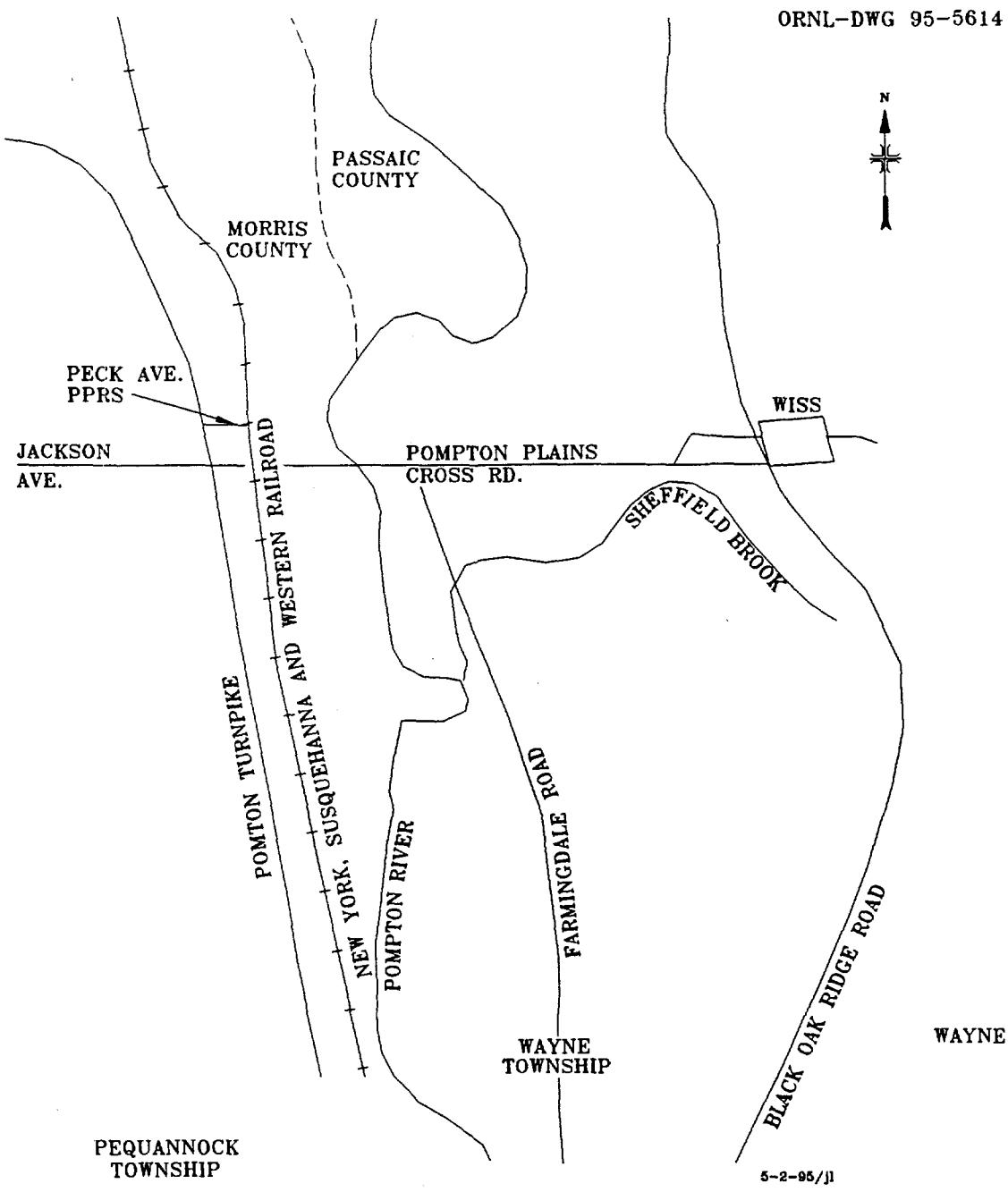

Fig. 1. Diagram showing general location of the Wayne Interim Storage Site (WISS) relative to the Wayne and Pequannock, New Jersey vicinity properties.

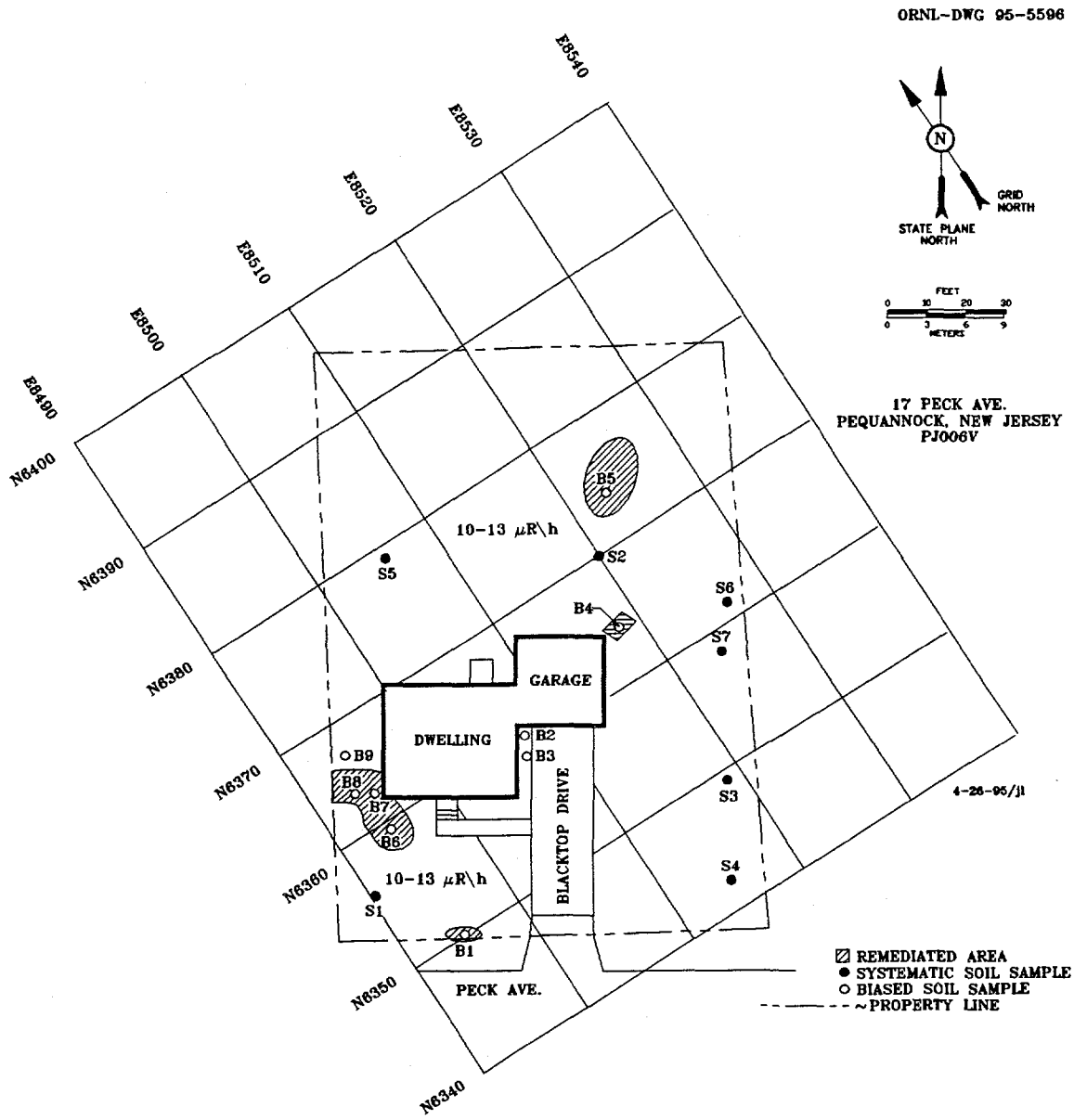

Fig. 2. Diagram of the property at 17 Peck Ave., Pequannock, New Jersey showing soil sampling locations and gamma measurements.

Table 1. Concentrations of radionuclides in soil and other materials at 17 Peck Ave., Pequannock, New Jersey (PJOO6V)

Sample number[a]	Grid location	Depth (cm)	Radionuclide concentration (pCi/g)[b]		
			^{226}Ra	^{232}Th	^{238}U
			Systematic samples[c]		
S1A	6355N,8491E	0-15	0.89±0.08	1.2 ±0.1	0.75±0.4
S1B		15-30	0.74±0.1	0.99±0.2	1.0 ±0.4
S2	6370N,8520E	0-15	0.73±0.1	1.4 ±0.2	0.46±0.3
S3	6349N,8519E	0-15	0.70±0.07	1.4 ±0.2	0.61±0.5
S4A	6342N,8516E	0-15	0.71±0.1	1.05±0.1	1.2 ±0.6
S4B		15-30	0.86±0.1	1.9 ±0.2	0.52±0.3
S4C		30-45	0.93±0.1	1.4 ±0.2	0.75±0.4
S5	6377N,8506E	0-15	0.76±0.1	1.03±0.2	0.93±0.6
S6	6362N,8527E	0-120*	0.72±0.07	1.4 ±0.2	0.93±0.4
S7	6358N,8524E	0-90*	0.53±0.09	1.1 ±0.2	1.0 ±0.3
			Biased samples[d]		
B1	6350N,8495E	0-15	0.77±0.09	1.2 ±0.2	1.0 ±0.5
B2	6361N,8508E	0-15	0.60±0.08	0.96±0.1	0.70±0.3
B3	6359N,8507E	0-15	0.72±0.08	1.1 ±0.2	1.2 ±0.4
B4	6363N,8518E	0-15	0.74±0.08	1.9 ±0.2	1.7 ±0.2
B5	6372N,8523E	0-15	0.95±0.08	3.0 ±0.2	2.9 ±0.8
B6	6359N,8495E	0-15	0.86±0.09	1.9 ±0.2	0.66±0.3
B7	6362N,8496E	0-15	0.94±0.09	2.1 ±0.2	1.4 ±0.5
B8	6363N,8495E	0-15**	1.02±0.09	2.2 ±0.2	1.8 ±0.7
B9A	6366N,8495E	0-15	1.9 ±0.2	10 ±2.0	2.4 ±1
B9B		15-30	0.78±0.1	0.97±0.2	0.66±0.2

[a]Locations of soil samples are shown on Fig. 2.
[b]Indicated counting error is at the 95% confidence level (± 2σ).
[c]Systematic samples are taken at locations irrespective of gamma exposure rates.
[d]Biased samples are taken from areas with elevated gamma exposure rates.
*Samples taken from a trench in the side yard east of the house.
**Sample taken 2 in below surface level in remediated area.

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