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**Results of the Independent
Radiological Verification Survey
at the Former C. H. Schnoor and
Company Site, 644 Garfield Street,
Springdale, Pennsylvania
(CVP001)**

**M. E. Murray
K. S. Brown**

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

HEALTH SCIENCES RESEARCH DIVISION
Environmental Restoration and Waste Management Non-Defense Programs
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CONTENTS

LIST OF FIGURES	v
LIST OF TABLES	vii
ACKNOWLEDGMENTS	ix
ABSTRACT	xi
INTRODUCTION	1
VERIFICATION PROCEDURES	1
VERIFICATION SURVEY RESULTS	2
CONCLUSIONS	3
REFERENCES	3

LIST OF FIGURES

- 1 Diagram of the Conviber Building and surrounding survey area at the site 4
- 2 Locations of smears, systematic scoping samples, and systematic and biased verification samples inside the Conviber Building 5
- 3 Locations of systematic scoping samples at the quonset hut adjacent to the Conviber Building 6

LIST OF TABLES

1	Applicable guidelines for protection against radiation	7
2	Background radiation levels for the area near Springdale, Pennsylvania	8
3	Concentrations of ^{238}U in scoping and verification samples at the former C. H. Schnoor and Company Site, Springdale, Pennsylvania	9

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ABSTRACT

At the request of the U.S. Department of Energy (DOE), a team from Oak Ridge National Laboratory (ORNL) conducted an independent radiological verification survey at the former C. H. Schnoor and Company Site in Springdale, Pennsylvania. The survey was performed from August to October of 1994. The purpose of the survey was to verify that the site was remediated to levels below DOE guidelines for FUSRAP sites.

Results of the independent radiological verification survey at the former C. H. Schnoor and Company Site confirm that the residual uranium contamination at the site is below DOE FUSRAP guidelines for unrestricted use.

**Results of the Independent Radiological Verification Survey
at the Former C. H. Schnoor and Company Site,
644 Garfield Street, Springdale, Pennsylvania
(CVP001)***

INTRODUCTION

The former C. H. Schnoor and Company Site is located at 644 Garfield Street in Springdale, Pennsylvania. During the mid-1940's, the property was owned by C. H. Schnoor and Company, and was used to machine extruded uranium for the Hanford Pile Project. The uranium operation may have continued until the spring of 1951, when the building was sold to a manufacturer of toys and coat hangers. In 1967 the property was acquired by the Unity Railway Supply Company, who founded the Premier Manufacturing Company and used the site to manufacture journal lubricators for railroad cars. The current owner, Conviber, Inc., uses the site for the fabrication of industrial hoses and conveyer belts.¹

At the request of the U.S. Department of Energy (DOE), a team from Oak Ridge National Laboratory conducted an independent radiological verification survey at the former C. H. Schnoor and Company Site, Springdale, Pennsylvania. Figure 1 is a diagram of the building and surrounding surveyed area. The survey was performed from September to October of 1994. The purpose of the survey was to determine whether radioactivity from residues of ²³⁸U inside the Conviber Building and an adjacent quonset hut, was remediated to a level below acceptable DOE guideline levels for FUSRAP sites by Bechtel National, Inc. (BNI).

VERIFICATION PROCEDURES

A description of the typical survey methods and instrumentation providing guidance for the verification survey may be found in *Measurement Applications and Development Group Guidelines*, ORNL-6782 (January 1995).²

Gamma radiation levels were determined using portable NaI gamma scintillation meters; beta/gamma measurements were made with GM "pancake" probes; alpha measurements were made with ZnS "beer mug" detectors. A large-area proportional detector was used to scan floors.

*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.

The indoor survey of the building included the following:

- Measurement of alpha and beta-gamma radiation levels in all accessible areas of the building, after remediation activities occurred and wherever areas of elevated radiation levels were indicated during surveying activities.
- Smears of floor surfaces in the room adjacent to the new loading dock for measurement of transferable alpha and beta-gamma radioactivity levels. Smear locations are shown on Fig. 2.
- Sampling and radionuclide analysis of systematic scoping samples from floors in the Conviber Building (Fig. 2) and the adjacent quonset hut (Fig. 3). These samples were taken prior to remedial action.
- Sampling and radionuclide analysis of systematic and biased verification samples from floors in the Conviber Building (Fig. 2). These samples were taken after the BNI post-remedial action survey.

In addition to conducting independent radiological surveys, ORNL staff reviewed the radiological survey data resulting from BNI post-remedial action work.

VERIFICATION SURVEY RESULTS

DOE generic guidelines are summarized in Table 1. The site-specific guideline for total uranium is 100 pCi/g.³ Typical background radiation levels for the Springdale, Pennsylvania area are presented in Table 2. These data are provided for comparison with survey results presented in this section. Background concentrations have not been subtracted from radionuclide concentrations measured in soil samples.

All floor, wall, subfloor, and overhead surfaces previously known to be or suspected of being contaminated were confirmed to be within DOE guidelines at the end of the verification survey. Results of field and laboratory analyses of systematic scoping samples and systematic and biased verification samples are listed in Table 3 for ²³⁸U, the only contaminant identified. The field analyses were made using a NaI gamma spectroscopy system. Shortly after samples were collected, the NaI detection system was used to provide a "field screening" analysis enabling technicians to define the radiological status of the remediation effort. The correlation between field screening and laboratory results is generally acceptable, with some outliers. As set up, the field screening results were not reliable below 15 pCi/g of ²³⁸U.

Soil samples fall into one of three categories based on time of collection. The first group includes scoping samples collected prior to remediation. The second group includes samples which were collected during remediation to determine if further excavation was required. The last group represents a sampled area after successful remediation. Sample depth as listed in Table 3 is measured relative to the original concrete surface. Therefore, the first sample increment collected from a sampling site in an excavated area might have

a depth far below the original surface, with no samples between the original surface and the excavated surface.

In all sample locations where the uranium concentrations exceeded the average concentration guideline, one of the following occurred: (1) The contaminant was removed later, (2) the area average concentration was determined to be less than the guideline, or (3) the residual concentration was less than the DOE "hot spot" criteria (see Table 1). In most cases, the ALARA concept prevailed and the contamination was removed.

All smear samples taken on surfaces throughout the building indicated transferable radioactivity levels below the minimum detectable activity (MDA) of the instruments.

CONCLUSIONS

Review of BNI survey results by ORNL, and the independent radiological verification survey by ORNL at the former C. H. Schnoor and Company Site confirm that the site meets the DOE radiological guidelines for unrestricted use.

REFERENCES

1. R. L. Coleman, M. E. Murray, and K. S. Brown, *Results of the Supplementary Radiological Survey at the Former C. H. Schnoor and Company Site, 644 Garfield Street, Springdale, Pennsylvania*, ORNL/RASA-94/3, Martin Marietta Energy Systems, Inc., Oak Ridge Natl. Lab., May 1995.
2. *Measurement Applications and Development Group Guidelines*, ORNL-6782, Martin Marietta Energy Systems, Inc., Oak Ridge Natl. Lab., January 1995.
3. Memo, J. W. Wagoner II, Director, Off-Site/Savannah River Program Division, Office of Eastern Area Programs, Office of Environmental Restoration, U.S. DOE, to L. K. Price, Director, Former Sites Restoration Division, Oak Ridge Field Office, U.S. DOE, August 25, 1994.

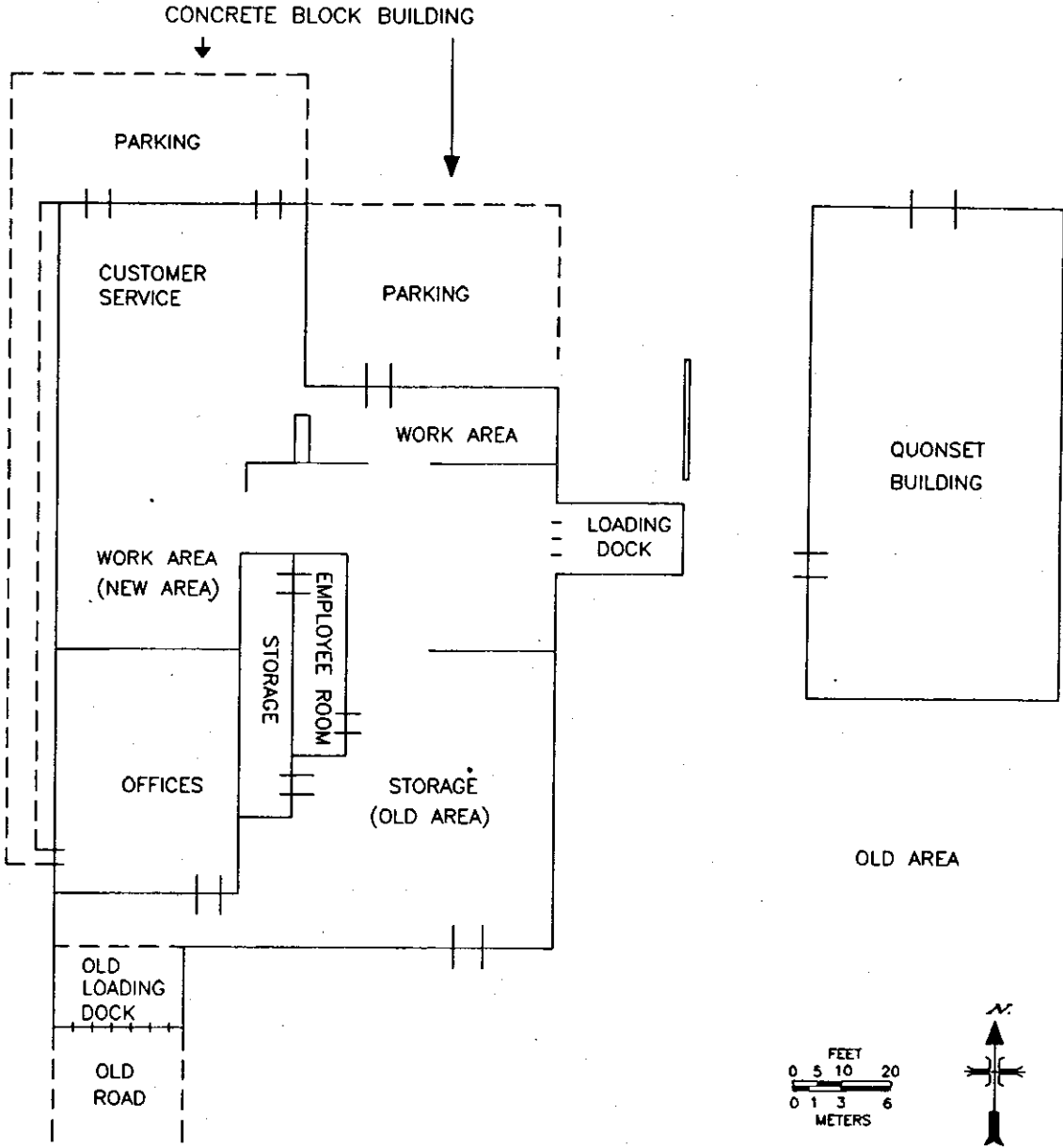


Fig. 1. Diagram of the Conviber Building and surrounding survey area at the site.

● SCOPING SYSTEMATIC SOIL SAMPLE

ORNL-DWG 95-5618

CONVIBER, INC.
644 GARFIELD ST.
SPRINGDALE, PA
CVP001

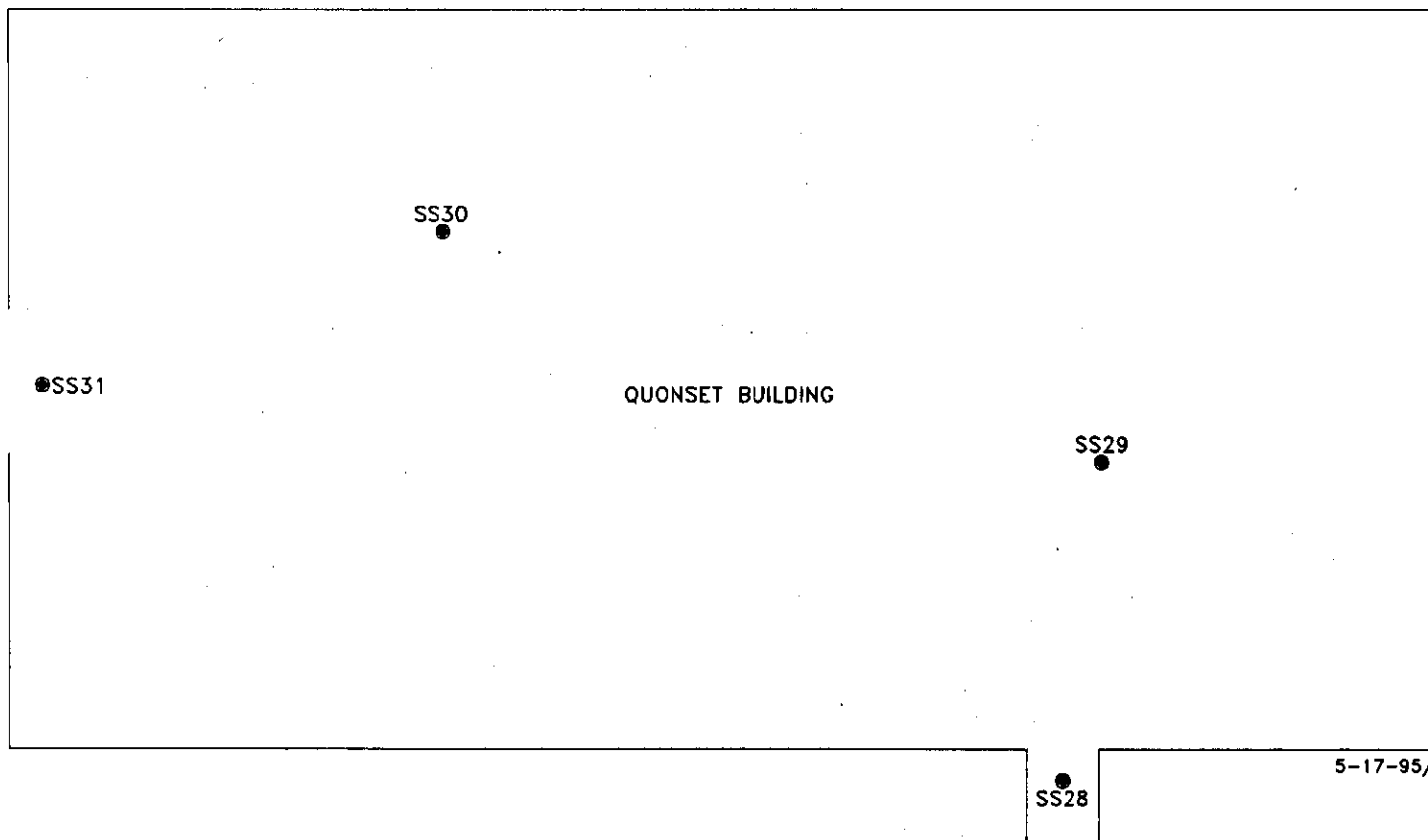


Fig. 3. Locations of systematic scoping samples at the quonset hut adjacent to the Conviber Building.

**Table 1. Applicable guidelines for protection against radiation
(Limits for uncontrolled areas)**

Mode of exposure	Exposure conditions	Guideline value
Total residual surface contamination ^a	²³⁸ U, ²³⁵ U, U-natural (alpha emitters)	
	Maximum	15,000 dpm/100 cm ²
	Average	5,000 dpm/100 cm ²
	Removable	1,000 dpm/100 cm ²
Derived concentrations	Total uranium	100 pCi/g ^{b, c}
Guideline for non-homogeneous contamination (used in addition to the 100-m ² guideline) ^d	Applicable to locations with an area ≤ 25 m ² , with significantly elevated concentrations of radionuclides ("hot spots")	$G_A = G_i(100/A)^{1/2}$, where G_A = guideline for "hot spot" of area (A) G_i = guideline averaged over a 100-m ² area

^aDOE surface contamination guidelines are consistent with *NRC Guidelines for Decontamination at Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product, Source, or Special Nuclear Material*, May 1987.

^bMemo, J. W. Wagoner II, Director, Off-Site/Savannah River Program Division, Office of Eastern Area Programs, Office of Environmental Restoration, U.S. DOE, to L. K. Price, Director, Former Sites Restoration Division, Oak Ridge Field Office, U.S. DOE, August 25, 1994.

^cThe guideline value for ²³⁸U was 50 pCi/g.

^dDOE guidelines specify that every reasonable effort shall be made to identify and to remove any source that has a concentration exceeding 30 times the guideline value, irrespective of area (adapted from *Revised Guidelines for Residual Radioactive Material at FUSRAP and Remote SFMP Sites*, April 1987).

Sources: Adapted from U.S. Department of Energy, DOE Order 5400.5, April 1990, and U.S. Department of Energy, *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites*, Rev. 2, March 1987; and U. S. Department of Energy Radiological Control Manual, DOE N 5480.6 (DOE/EH-256T), June 1992.

Table 2. Background radiation levels for the area near Springdale, Pennsylvania

Type of radiation measurement or sample	Radiation level or radionuclide concentration
Average external gamma exposure rate at 1 m above ground surface	6 $\mu\text{R/h}^a$
Concentration of radionuclides in surface soil	
^{238}U	1.7 pCi/g ^b

^aAverage of 3 to 4 measurements.

^bError in measurement is $\pm 5\%$ (2σ).

Source: T. E. Myrick, B. A. Berven, and F. F. Haywood, *State Background Radiation Levels: Results of Measurements Taken During 1975-1979*, ORNL/TM-7343, Martin Marietta Energy Systems, Inc., Oak Ridge Natl. Lab., November 1981.

Table 3. Concentrations of ^{238}U in scoping and verification samples at the former C. H. Schnoor and Company Site, Springdale, Pennsylvania

Sample ID ^a	Depth (cm)	Uranium-238 concentration (pCi/g) ^b	
		Gamma-spectroscopy laboratory analysis	Field analysis ^c
<i>Scoping systematic samples^d</i>			
SS19B	15-30	1.9 ± 0.5	10
SS19C	30-45	4.0 ± 0.3	17
SS20B	15-30	4.0 ± 1.0	14
SS20C	30-45	4.6 ± 1.0	16
SS21B	15-30	3.8 ± 0.7	11
SS21C	30-45	4.8 ± 1.1	19
SS21D	45-61	4.0 ± 1.0	22
SS22B	15-30	3.0 ± 0.3	13
SS22C	30-45	14 ± 2	24
SS22D	45-61	24 ± 4	28
SS23B	15-30	3.2 ± 0.3	18
SS23C	30-45	14 ± 3	25
SS24B	15-30	8.0 ± 1.5	17
SS24C	30-45	14 ± 2	18
SS24D	45-61	8.5 ± 1.5	17
SS25B	15-30	5.0 ± 1.0	12
SS25C	30-45	9.0 ± 0.9	16
SS25D	45-61	4.7 ± 0.5	15
SS26B	15-30	4.7 ± 0.9	16
SS26C	30-45	12 ± 2	20
SS27B	15-30	17 ± 2	27
SS27C	30-45	60 ± 4	49
SS27D	45-61	70 ± 10	60
SS28B	15-30	3.2 ± 0.3	10
SS29B	15-30	2.3 ± 1.0	10
SS29C	30-45	1.1 ± 0.5	11
SS30B	15-30	2.9 ± 1.0	9
SS30C	30-45	1.3 ± 0.6	14

Table 3 (continued)

Sample ID ^a	Depth (cm)	Uranium-238 concentration (pCi/g) ^b	
		Gamma-spectroscopy laboratory analysis	Field analysis ^c
SS31B	15-30	1.2 ± 0.7	13
SS31C	30-45	2.9 ± 0.5	14
<i>Verification systematic samples^d</i>			
VS1	20-25	18 ± 1	22
VS2	41-56	1.5 ± 0.3	13
VS3	45-61	190 ± 10	214
VS4	30-45	12 ± 1	22
VS5A	30-45	8.4 ± 0.4	13
VS5B	45-61	15 ± 2	16
VS6A	30-45	12 ± 2	12
VS6B	45-61	14 ± 1	11
VS7A	30-45	54 ± 3	24
VS7B	45-61	29 ± 3	23
VS8A	30-45	17 ± 2	17
VS8B	45-61	41 ± 3	32
VS9A	30-45	10 ± 1	12
VS9B	45-61	14 ± 2	19
VS10A	30-45	5.6 ± 1.1	11
VS10B	45-61	7.3 ± 1.4	11
VS11A	30-45	12 ± 2	13
VS11B	45-61	18 ± 1	16
VS12A	30-45	7.1 ± 1.2	11
VS12B	45-61	18 ± 1	15
VS13	61-76	1.9 ± 0.4	10
VS14	61-76	2.9 ± 0.6	8
VS15	61-76	13 ± 1	13
VS16	61-76	14 ± 1	16
VS17	61-76	4.6 ± 0.5	10

Table 3 (continued)

Sample ID ^a	Depth (cm)	Uranium-238 concentration (pCi/g) ^b	
		Gamma-spectroscopy laboratory analysis	Field analysis ^c
VS18	61-76	4.9 ± 0.7	10
VS19	61-76	8.9 ± 1.3	13
VS20	61-76	1.4 ± 0.5	9
VS21	61-76	1.8 ± 0.5	9
VS22	61-76	2.3 ± 0.5	11
VS23	61-76	17 ± 2	17
VS24	0-15	1.3 ± 0.5	10
VS25	0-15	2.7 ± 0.5	13
VS26	0-15	2.5 ± 0.6	12
VS27	0-15	3.8 ± 0.6	11
VS28	0-15	3.6 ± 0.5	12
VS29	0-15	6.4 ± 1.5	16
VS30	0-15	2.6 ± 0.7	12
VS31	0-15	1.6 ± 0.5	11
VS32	0-15	1.1 ± 0.5	11
VS33	0-15	1.8 ± 0.6	10
VS34	0-15	2.0 ± 0.4	13
VS35	0-15	2.3 ± 0.3	10
VS36	30-46	31 ± 3	24
<i>Verification biased samples^d</i>			
VB1A	15-30	170 ± 10	126
VB1B	30-45	240 ± 20	185
VB2	45-61	85 ± 10	73
VB3A	30-45	50 ± 5	48
VB3B	45-61	160 ± 30	136

Table 3 (continued)

Sample ID ^a	Depth (cm)	Uranium-238 concentration (pCi/g) ^b	
		Gamma-spectroscopy laboratory analysis	Field analysis ^c
VB4	61-69	2800 ± 400	2436
VB5	35-41	90 ± 5	86
VB6	45-61	110 ± 20	81
VB7	45-61	27 ± 1	39
VB8	30-46	110 ± 10	72
VB9	61-76	100 ± 15	620
VB10A	5-20	1.3 ± 0.4	not analyzed
VB10B	20-25	1.4 ± 0.3	
VB11A	5-20	2.5 ± 0.4	13
VB11B	20-36	1.1 ± 0.5	15
VB11C	36-51	1.8 ± 0.3	14
VB11D	51-66	1.5 ± 0.5	11
VB12	30-46	28 ± 2	28
VB13	45-61	75 ± 7	55
VB14	45-61	75 ± 10	61
VB15	45-61	150 ± 30	122
VB16	45-61	39 ± 3	34
VB17	30-46	30 ± 1	36
VB18	30-46	30 ± 4	25
VB19	30-46	37 ± 3	37
VB20	30-46	24 ± 5	21
VB21	30-46	70 ± 10	55
VB22	30-46	1300 ± 300	843
VB23	15-31	17 ± 2	18
VB24	15-31	31 ± 3	32
VB25	15-31	44 ± 2	37

Table 3 (continued)

Sample ID ^a	Depth (cm)	Uranium-238 concentration (pCi/g) ^b	
		Gamma-spectroscopy laboratory analysis	Field analysis ^c
VB26	15-31	85 ± 10	77
VB27	15-31	5.4 ± 0.5	12
VB28	15-31	6.6 ± 1.2	15
VB29	15-31	32 ± 4	39
VB30	15-31	21 ± 3	31
VB31A	213-229	75 ± 5	96
VB31B	229-244	70 ± 10	91
VB31C	244-259	55 ± 5	67
VB32	concrete chips	54 ± 5	70
VB33A	213-229	27 ± 3	43
VB33B	229-244	15 ± 2	29
VB34A	122-137	0.9 ± 0.5	11
VB34B	137-152	0.8 ± 0.3	11
VB34C	152-168	1.0 ± 0.2	10
VB34D	168-183	1.2 ± 0.3	10
VB34E	183-198	0.7 ± 0.4	10
VB34F	198-213	1.1 ± 0.2	11
VB35	183-198	100 ± 15	107
VB36	183-198	70 ± 10	109
VB37A	137-152	1.1 ± 0.6	10
VB37B	152-168	1.3 ± 0.4	13
VB37C	168-183	1.4 ± 0.5	13
VB37D	183-198	1.3 ± 0.9	10
VB37E	198-213	0.6 ± 0.3	9
VB38	221-236	25 ± 4	43
VB39	213-229	2.1 ± 0.2	13

Table 3 (continued)

Sample ID ^a	Depth (cm)	Uranium-238 concentration (pCi/g) ^b	
		Gamma-spectroscopy laboratory analysis	Field analysis ^c
VB40	0-15	3.4 ± 0.9	10
VB41	0-15	5.0 ± 1.5	13

^aSample locations are shown on Figs. 2 and 3.

^bIndicated counting error is at the 95% confidence level ($\pm 2\sigma$). Results for other radionuclides are typical of background concentrations and are not included in the table.

^cThe correlation between field screening and laboratory results is generally acceptable, with some outliers. As set up, field screening results are not reliable below 15 pCi/g of ²³⁸U.

^dSystematic samples are taken at locations irrespective of gamma exposure rates.

^eBiased samples are taken from areas with elevated gamma exposure rates.

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