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Energy/
Environment
Systems Division

June 25, 1990

Mr. George France
Region III
Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Subject: SURVEY OF CONSTRUCTION AREA - COMBUSTION ENGINEERING,
HEMATITE, MO

Dear Mr. France:

Attached are the results of measurements and sampling performed May 31, 1990 in the construction area at the Combustion Engineering site in Hematite, Missouri. As can be noted from the findings, there appears to be a reduction in the level of residual uranium contamination; however, most of the sampled locations continue to exceed the 30 pCi/g guideline level for total enriched uranium.

Requests for additional information may be referred to Tim Vitkus at FTS 626-5073.

Sincerely,

Lawrence F. Friedman

for James D Berger, Program Director
Environmental Survey and Site
Assessment Program

JDB:jls

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FOLLOWUP RADIOLOGICAL SURVEY OF CONSTRUCTION AREA
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI

INTRODUCTION

At the request of the Nuclear Regulatory Commission's (NRC's) Region III Office, Oak Ridge Associated Universities (ORAU) conducted a confirmatory radiological survey of the Phase 2 construction area at Combustion Engineering's Hematite, Missouri facility, in September 1989. This survey identified residual areas of low level uranium contamination in portions of the site where a new building foundation and slab was to be constructed. Further remediation of these areas has been performed and the NRC requested that ORAU conduct a followup survey of the radiological status of the soils beneath the new building. This survey was performed on May 31, 1990. Procedures and findings are presented in this report.

SURVEY PROCEDURES

1. The 10 m x 10 m reference grid established previously (Figure 1) was used to reference survey activities.
2. Gamma scans were conducted over soil surfaces within the gridded portion of the construction site. NaI(Tl) gamma scintillation detectors with audible indicating

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scaler/ratemeters were used to perform scanning surveys. Locations of elevated radiation levels were noted for further investigation.

3. Surface soil samples were obtained from fourteen locations (Figure 2). Samples were analyzed by gamma spectrometry at the ORAU laboratory facility in Oak Ridge, Tennessee.
4. Exposure rate measurements were performed at the surface and 1 m above the surface at each of the sampling locations, using a gamma scintillation detector, cross calibrated for enriched uranium with a pressurized ionization chamber.

RESULTS

General gamma radiation levels at 1 m above the surface ranged from 7 to 12 $\mu\text{R/h}$; for comparison the usual background level for the Hematite area is approximately 6 to 10 $\mu\text{R/h}$. Scans identified several isolated locations of elevated contact radiation levels; exposure rates at these locations ranged up to 14 $\mu\text{R/h}$ at contact and to 12 $\mu\text{R/h}$ at 1 m above the surface. Results of gamma measurements are presented in Table 1.

Table 2 summarizes the concentrations of uranium in soil samples collected from the excavated areas. Concentrations of U-235 and U-238 ranged from 0.3 to 13.7 pCi/g and from 2.2 to 58 pCi/g, respectively. On the basis of the previously determined U-234/U-235 activity ratio of 26, the total uranium levels in the samples ranged from 10 to 430 pCi/g. The direct radiation levels and uranium concentrations are slightly lower than those measured during the September 1989 survey; however, most of the locations continue to exhibit uranium levels above the current Option I guideline of the NRC Branch Technical Position.

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TABLE 1

EXPOSURE RATE MEASUREMENTS
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI

Location ^a	Grid Coordinate		Exposure Rate (μ R/h)	
	N	E	At 1 m Above Surface	At Surface Contact
1	17	12	9	9
2	3.5	14.5	7	12
3	37	7.5	9	11
4	32	4	9	10
5	29	0	9	12
6	28	2.5	12	14
7	23	0	12	14
8	26	6	12	13
9	34	15	7	9
10	5	7.5	10	14
11	15	7.5	10	12
12	25	12.5	7	8
13	35	12.5	7	6
14	18	20	9	14

^aRefer to Figure 2.

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TABLE 2

URANIUM CONCENTRATIONS IN SOIL
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI

Sample ^a	Grid Coordinate		Uranium Concentration (pCi/g)		
	N	E	U-235	U-238	Total U ^c
1	17	12	1.2 ± 0.1 ^b	6.1 ± 1.6	39
2	3.5	14.5	10.4 ± 0.3	12.4 ± 7.6	290
3	37	7.5	3.4 ± 0.2	3.4 ± 2.2	95
4	32	4	0.3 ± 0.1	2.2 ± 0.9	10
5	29	0	4.1 ± 0.1	8.3 ± 1.1	120
5 duplicate	29	0	4.5 ± 0.2	9.9 ± 1.5	130
6	28	2.5	2.9 ± 0.2	<3.5	82
7	23	0	7.4 ± 0.3	<4.5	230
8	26	6	2.1 ± 0.1	6.6 ± 1.7	63
9	34	15	2.8 ± 0.2	2.8 ± 1.4	78
10	5	7.5	13.7 ± 0.3	58 ± 12	430
11	15	7.5	1.3 ± 0.2	5.8 ± 1.2	41
11 duplicate	15	7.5	1.6 ± 0.2	7.6 ± 1.6	51
12	25	12.5	1.5 ± 0.1	3.8 ± 0.9	44
13	35	12.5	1.2 ± 0.1	4.6 ± 1.0	37
14	18	20	0.5 ± 0.2	4.3 ± 2.0	18

^aRefer to Figure 2.

^bUncertainties represent the 95% confidence level, based only on counting statistics; additional laboratory uncertainties of ±6 to 10% have not been propagated into these data.

^cCalculated, utilizing U-234/U-235 activity ratio of 26.

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