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September 25, 1989

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Energy/
Environment
Systems Division

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

Subject: SOIL SAMPLING AT LIMESTONE PILES A AND C
HEMATITE, MISSOURI

Dear Mr. France:

On August 10, 1989, ORAU performed soil sampling downstream of limestone piles A and C at the Combustion Engineering (CE) facility in Hematite, MO. The survey procedures and results of sample analysis are provided in the enclosed letter report. Also provided in the report are the results of analysis on four soil samples collected by CE.

If you have any questions, please refer them to me at FTS 626-3305.

Sincerely,

Phyllis R. Cotten
Health Physics Team Leader
Environmental Survey and
Site Assessment Program

PRC:jls

cc: L. ~~Boone~~, NRC/6H3
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SOIL SAMPLING RESULTS
LIMESTONE PILES A AND C
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI

Prepared by:
P. R. Cotten

INTRODUCTION

The Combustion Engineering, Inc. (CE) facility in Hematite, Missouri, manufactures nuclear fuels under Nuclear Regulatory Commission (NRC) special nuclear materials license SNM-33. Limestone rock chips are used in dry scrubbers to remove hydrogen fluoride from the offgas stream of the UF_6 to UO_2 conversion process; chips are partially converted to calcium fluoride in the scrubbers, and are referred to as "spent limestone" after removal from the scrubbers. Combustion Engineering conducts a monitoring program to determine the activity level of the spent limestone for deciding upon its disposition. The spent limestone is monitored for gross alpha and beta activity, and, if there is no measurable alpha activity and beta activity is less than 5 times background, the limestone is released of use as on-site fill. Piles A and C (Figure 1) contain spent limestone in this category. Spent limestone with detectable alpha activity (up to 1000 dpm/100 cm^2) is quarantined in an intermediate storage pile, southeast of Building 255 (Location B on Figure 1). If the activity level exceeds 1000 dpm/100 cm^2 , the limestone is disposed of at a licensed off-site burial facility.

At the request of the NRC, on August 10, 1989, the Environmental Survey and Site Assessment Program (ESSAP) of Oak Ridge Associated Universities (ORAU) conducted independent soil sampling in the vicinity of the limestone piles A

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and C. Exposure rates were measured at locations of these samples. In addition, four samples of limestone, collected previously by Combustion Engineering, were obtained for analysis. All samples were analyzed by gamma spectrometry.

RESULTS

Table 1 presents the results of exposure rate measurements at sampling locations near piles A and C. Exposure rates at contact and 1 m above the surface ranged from 6 to 9 $\mu\text{R/h}$. These levels are within the 6 to 10 $\mu\text{R/h}$ background range, determined previously for this region of Missouri.

Soil concentrations for samples collected from limestone piles A and C are in Table 2. Levels of U-238 ranged from 0.7 to 38.3 pCi/g; U-235 levels ranged from 0.1 to 5.0 pCi/g. Based on a U-234/U-235 activity ratio of 26, determined from previous analyses of samples from the CE facility, total uranium concentrations ranged from 3.4 to 150 pCi/g. Four of the five samples contained uranium levels above the NRC's option 1 guideline of 30 pCi/g. Sample 1 contained depleted or natural uranium while samples 3, 4, and 5 were enriched in U-235.

Analyses of samples provided by CE are summarized in Table 3. Levels of U-235 ranged from 0.5 to 40.0 pCi/g; U-238 levels ranged from 2.8 to 178 pCi/g. Total uranium concentrations were calculated to be 16.3 to 1200 pCi/g. All samples appear to be enriched in U-235.

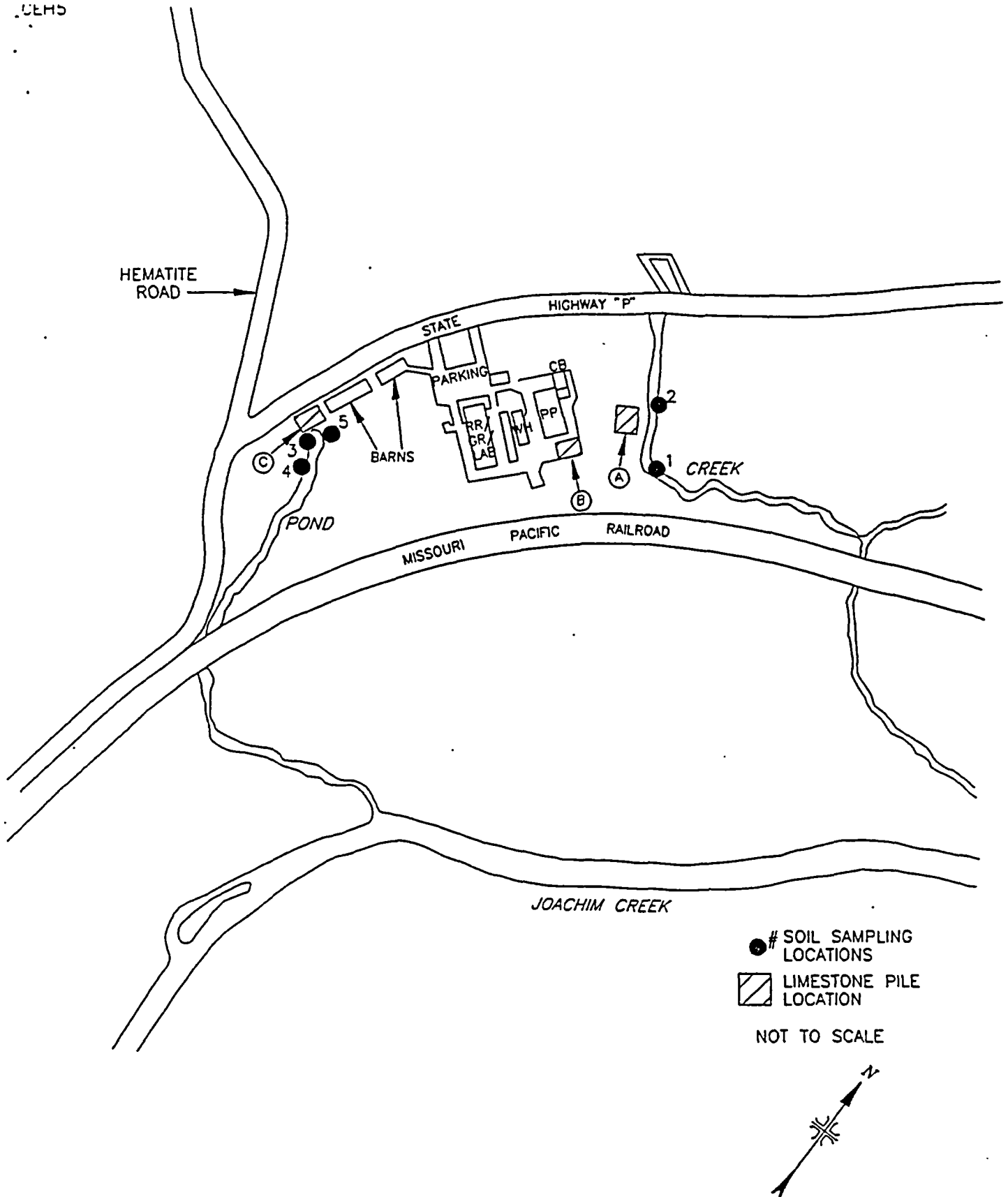


FIGURE 1: Locations of Spent Limestone Piles and Sampling Locations

TABLE 1

EXPOSURE RATE MEASUREMENTS
LIMESTONE PILES A & C
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI

Location ^a	Exposure Rate (μ R/h)	
	At 1 M Above Surface	At Surface Contact
1	8	8
2	6	6
3	9	9
4	9	9
5	9	9

^aRefer to Figure 1.

TABLE 2

URANIUM CONCENTRATIONS IN SOIL
LIMESTONE PILES A & C
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI

Sample ^a	Location	Uranium Concentration (pCi/g)		
		U-235	U-238	Total U ^c
1	Creek Bed E. of Pile A	0.7 ± 0.4 ^b	38.3 ± 2.7	57 ^d
2	Creek Bed N. of Pile A	0.1 ± 0.1	0.7 ± 0.6	3.4
3	Adjacent to Retain. Wall, E. of Pile C	2.4 ± 0.6	11.0 ± 1.8	76 ^d
4	Below Retain. Wall, Pile C	5.0 ± 0.8	14.7 ± 1.5	150 ^d
5	Adjacent to Wall N.E. of Pile C	4.1 ± 0.9	12.8 ± 2.2	120 ^d

^aRefer to Figure 1.

^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 a U-234/U-235 activity ratio of 26.

^dExceeds Option 1 guideline level of 30 pCi/g.

TABLE 3

ANALYSIS OF URANIUM CONCENTRATIONS IN SOIL SAMPLES
COLLECTED BY COMBUSTION ENGINEERING
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI

Sample	Identification ^a	Uranium Concentration (pCi/g)		
		U-235	U-238	Total U ^c
1	82	4.8 ± 0.8 ^b	20.7 ± 2.1	150
2	Q15	0.5 ± 0.4	2.8 ± 1.0	16.3
3	201	11.4 ± 0.5	39.7 ± 1.6	340
4	246	40.0 ± 1.3	178.0 ± 3.0	1200

^aSamples identification numbers assigned by CE.

^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 a U-234/U-235 activity ratio of 26.