Docket No. 70-36
License No. SNM-33

FEB 24 1989

Combustion Engineering, Inc.
ATTN: Dr. P. L. McGill, Vice President
Nuclear Fuel
1000 Prospect Hill Road
Windsor, CT 0695-0500

Gentlemen:

In your September 30, 1988, letter, you discussed the construction of additional manufacturing space at the Hematite facility. By letter dated October 31, 1988, NRC expressed no objection to Combustion Engineering (CE) initiating construction of the additional space provided that soil survey results were submitted to NRC for review prior to constructing any flooring. On December 20, 1988, CE submitted those soil survey results.

On January 24, 1989, Oak Ridge Associated Universities, conducted an independent survey and submitted the results to the NRC on February 16, 1989 (copy enclosed). Based on the survey results, residual contamination is less than the Option 1 limit of (30 pCi/gm) for enriched uranium as stated in the Branch Technical Position. Therefore, the staff has no objection to the construction of the pelletizing and warehouse flooring.

Sincerely,

Original Signed By

Leland C. Rouse, Chief
Fuel Cycle Safety Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Enclosure:
As stated

cc w/encl:
Mr. A. E. Scherer, Director
Nuclear Licensing

Mr. C. B. Brinkman, Manager
Washington Nuclear Operations

Mr. J. A. Rode, Plant Manager
Hematite Fuel Manufacturing

Mr. H. E. Eskridge, Supervisor
Licensing, Safety and Accountability

Distribution w/encl.

Docket 70-36	PDR	NRC File Center	NMSS R/F
IMUF R/F	IMSB R/F	VLTharpe	DAMcCaughey
Region III	GFrance, RIII	MHorn	LCRouse
GHBidinger			

OFC:	IMUF:	IMUF:	IMSB:
NAME:	DAMcCaughey:mh:	VLTharpe:	GHBidinger:	LCRouse:
DATE:	2/24/89	2/24/89	2/24/89	2/24/89

OFFICIAL RECORD COPY

R-11

Oak Ridge
Associated Universities
Post Office Box 117
Oak Ridge, Tennessee 37831-0117

Manpower Education
Research and Training
Division

February 16, 1989

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

Subject: SURVEY RESULTS FOR THE CE FACILITY IN HEMATITE, MISSOURI

Dear Mr. France:

The results of the recent survey performed at Combustion Engineering in Hematite, Missouri, are provided in the attached letter report. Survey results and laboratory analyses indicated 5 locations as having residual enriched uranium contamination, exceeding established NRC guidelines.

CE plant officials were informed of the findings through telephone communications. CE removed additional soil from those areas and provided followup soil samples for ORAU analysis. The analyses of these samples indicate that the additional actions were effective in eliminating and or reducing elevated levels to within guideline values.

Questions or additional information about survey results should be referred to Jim Berger at FTS 626-3305 or myself at FTS 626-3355.

Sincerely,

James A. Berger for

Phyllis R. Cotten
Health Physics Team Leader
Radiological Site Assessment Program

PRC:mec

cc: L. Rouse, NRC/6H3
D. Tiktinsky, NRC/6H3
G. LaRoche, NRC/6H3
E. Davis, NRC/Region III

RADIOLOGICAL SURVEY OF CONSTRUCTION SITE COMBUSTION ENGINEERING, INC. HEMATITE, MISSOURI

Prepared by:
P. R. Cotten

INTRODUCTION

The Combustion Engineering, Inc. facility in Hematite, Missouri, manufactures nuclear fuels under Nuclear Regulatory Commission (NRC) special nuclear materials license SNM-33. The plant is in the process of constructing additional manufacturing and warehouse space and a new utility area to increase production capacity. This new construction will be located between Buildings 240 and 255 (Figure 1). Construction is being performed in two phases. Phase 1 extends from Building 255 up to the present utility area and occupies a surface area of approximately 26 m x 70 m; Phase 2 construction, scheduled to begin later in 1989, will connect the Phase 1 construction area with Building 240.

In preparation for Phase 1 construction, two former buildings (Buildings 250 and 251) were removed. These buildings had been used primarily for storage of bulk chemicals, storage of containerized enriched uranium, and shipping/receiving activities; processing of uranium was never conducted in either of these buildings. In addition to the demolition of the two buildings, a section of contaminated sewer line was excavated.

Based on previous use of the construction site, the potential for radiological contamination was considered low. However, Combustion Engineering had performed surveys of the area, to document that the site satisfied the NRC guideline of 30 pCi/g of total uranium in the soil. At the request of the NRC, the Radiological Site Assessment Program of Oak Ridge Associated Universities

---

Prepared by the Manpower Education, Research, and Training Division of Oak Ridge Associated Universities, Oak Ridge, Tennessee, under interagency agreement, (NRC Fin. No. A-9076) between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy.

February 13, 1989

(ORAU) conducted an independent survey of the Phase 1 construction site on January 24, 1989, to confirm the accuracy of the licensee's survey and to provide additional data on the site status, relative to the NRC guidelines. Procedures and results of that survey are presented in this report.

SURVEY PROCEDURES

At the time of the survey, construction had already begun. Most of the footings and foundation for the building had been poured and three walls had been erected. To assist construction equipment in the area, approximately 30 cm of gravel had been spread over the construction site.

1. A 10 m x 10 m reference grid system was established in the Phase 1 construction area; the grid origin was located in the southwest corner of the new structure. This grid is shown on Figure 2.

2. Beta-gamma and gamma scans were conducted over soil surfaces within the gridded portion of the construction site and extended to about 1 m around the perimeter of the area. Thin-window GM and NaI(Tl) gamma scintillation detetors with audible indicating scaler/ratemeters were used to perform scanning surveys. Locations of elevated radiation levels were noted for further investigation.

3. Surface soil samples were obtained at ten locations and subsurface (depth - about 0.5 m) soil samples were obtained at four locations (Figure 2). Samples were collected from exposed soil areas (gravel removed) and trenches. A sample was also obtained from a location of slightly elevated direct radiation. Samples were analyzed by gamma spectrometry at the laboratory facilities in Oak Ridge, Tennessee; several samples were also analyzed for isotopic uranium by alpha spectroscopy.

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

Surface scans identified elevated direct radiation levels throughout an area adjacent to the southern portion of Building 255. The source of this radiation was uranium, stored inside Building 255. Because of the covering of gravel fill over most of the area, scanning was inconclusive as to the condition of much of the underlying soil. One area of surface contact radiation, significantly above the ambient level, was detected at grid location 23.5N, 25E. This finding was brought to the attention of the licensee and additional soil was removed from this location. Exposure rates at sampling locations ranged from 6 to 28 μR/h at both surface contact and 1 m above the surface (Table 1). For comparison, the background exposure levels in the area of this facility were in the range of 6 to 10 μR/h; this range is typical of normal background radiation in this region of Missouri. Higher levels were all near the extreme eastern portion of the construction site and were attributable to the materials stored inside Building 255.

Concentrations of uranium in soil samples are presented in Table 2. Levels of U-238 ranged from <0.5 to 38.1 pCi/g; U-235 levels ranged from <0.2 to 24.7 pCi/g. The highest concentrations of both uranium isotopes were in sample B1 from grid coordinate 23.5N, 25E. This was the location, identified by the surface scans. Alpha spectroscopy on several of the higher level samples indicated a ratio of U-234 to U-235 activity of approximately 26. Based on this isotopic ratio, soil samples from locations 3, 5, 7, 11 and B1 contained total uranium above the 30 pCi/g guideline level; samples from locations 2, 10, and 13 have associated statistical uncertainty levels which make them borderline with respect to the guideline values.

The licensee remediated areas in the vicinity of samples 3, 5, 7, 11 and B1 and provided follow-up samples from those areas for ORAU analysis. Results of these follow-up analyses (Table 3), indicate that concentrations have been reduced to below or near the guideline levels.

CONCLUSIONS

ORAU'S survey of the Phase 1 construction area indicated residual enriched uranium contamination at five locations, exceeding the NRC guideline values, and concentrations near guideline values at several other locations. Additional soil removal was effective in eliminating the "hot spots" and reducing the Phase 1 area to within the guideline levels.

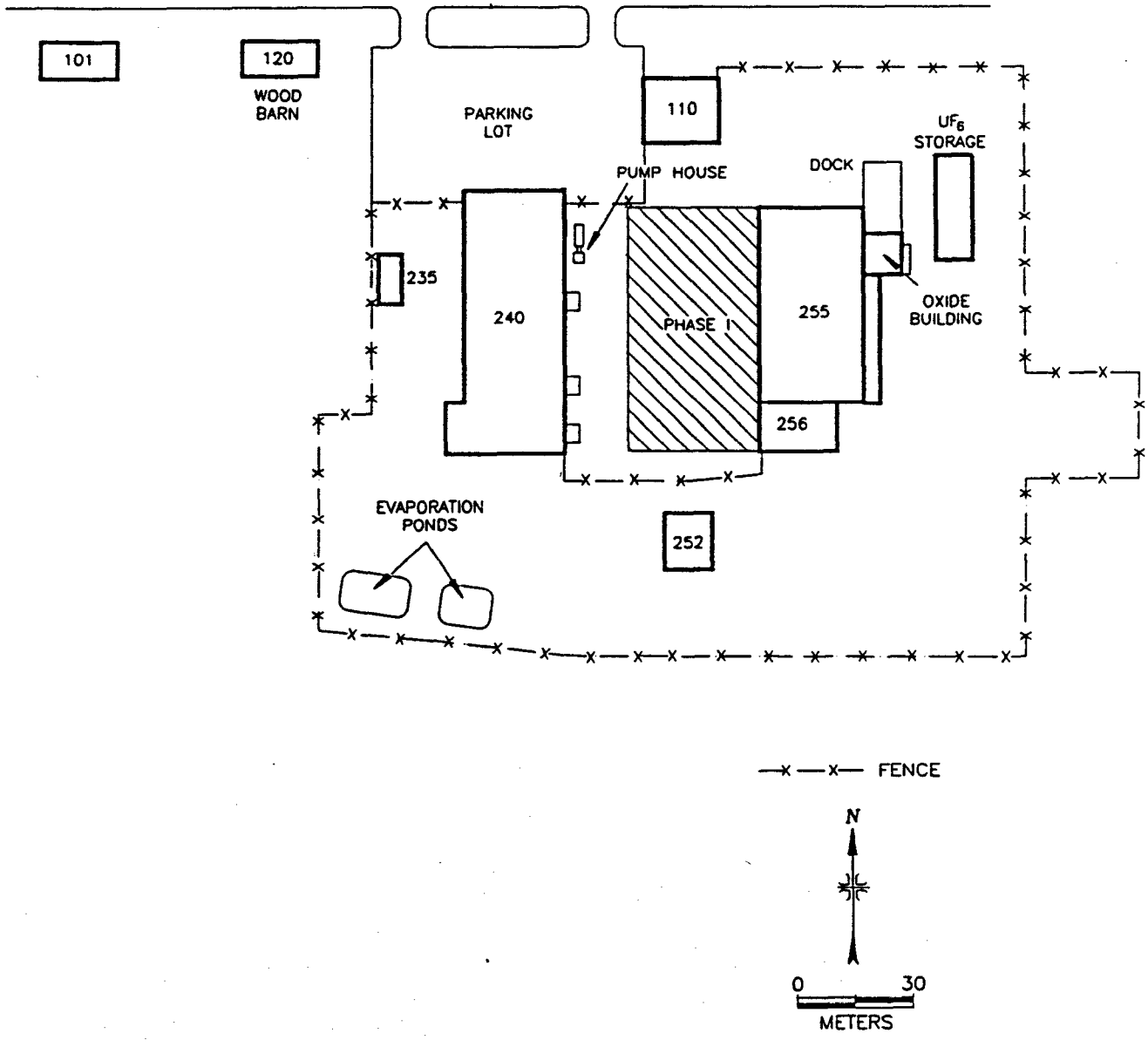

FIGURE 1: Layout of Plant Facility Indicating Phase I Construction Area

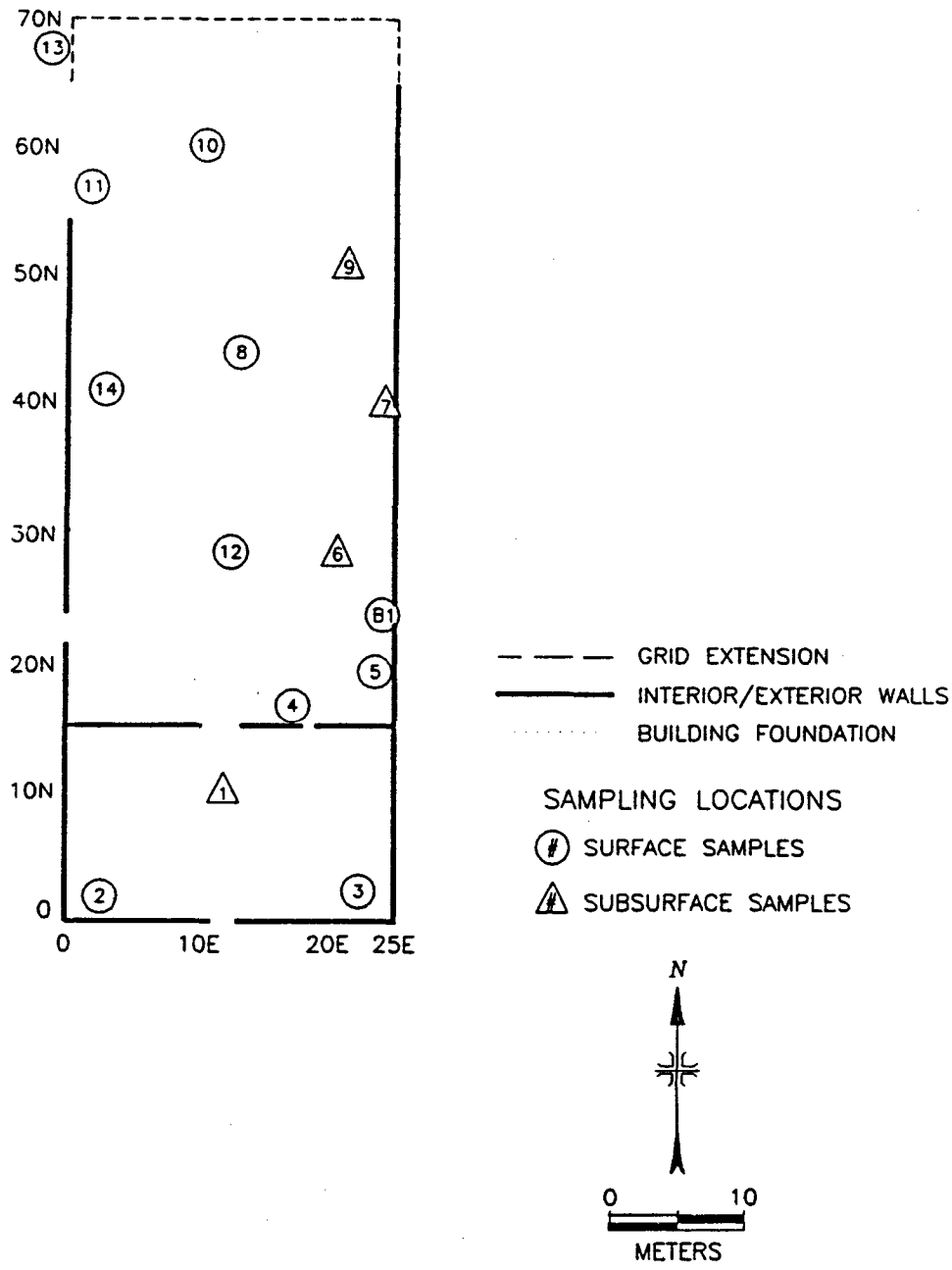

FIGURE 2: Soil Sampling Locations in Phase I Construction Area

TABLE 1

EXPOSURE RATE MEASUREMENTS
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI

Location[a]	Grid Coordinate	Exposure Rate (μR/h) (at 1 m above surface)	Exposure Rate (μR/h) (at surface contact)
1	10N, 12E	8	9
2	1.5N, 2E	6	6
3	1.5N, 22.5E	28[b]	28[b]
4	17.5N, 15E	9	9
5	20N, 25E	16[b]	11[b]
6	28N, 21E	11[b]	11[b]
7	40N, 25E	9	9
8	44N, 13E	6	8
9	51N, 21E	8	8
10	60N, 10E	8	8
11	57N, 0.5E	8	8
12	28N, 12E	8	8
13	68N, 0.5E	6	8
14	41N, 2E	6	8
B1	23.5N, 25E	14[b,c]	14[b,c]

[a]Refer to Figure 2.
[b]Elevated levels, due to uranium storage in nearby Building 255.
[c]Measurement after additional cleanup actions.

TABLE 2

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

Location[a]	Grid Coordinate	Uranium Concentration (pCi/g) U-235	U-238	Total U[d]
1	10N, 12E[b]	0.2 ± 0.1[c]	<0.6	6.0
2	1.5N, 2E[b]	1.0 ± 0.3	5.6 ± 0.4	32.6
3	1.5N, 22.5E	6.1 ± 0.4	17.4 ± 1.1	182.1[e]
4	17.5N, 15E	0.5 ± 0.2	<0.5	14.0
5	20N, 25E	2.4 ± 0.3	4.3 ± 0.4	69.1[e]
6	28N, 21E[b]	<0.2	1.3 ± 0.6	6.7
7	40N, 25E[b]	8.6 ± 0.6	30.4 ± 1.2	262.6[e]
8	44N, 13E	0.7 ± 0.3	2.5 ± 0.7	21.4
9	51N, 21E[b]	<0.2	1.2 ± 0.5	6.6
10	60N, 10E	0.8 ± 0.3	2.1 ± 1.2	23.7[f]
11	57N, 0.5E	1.4 ± 0.3	2.7 ± 0.5	40.5[e]
12	28N, 12E	<0.2	<0.8	6.2
13	68N, 0.5E	1.1 ± 0.3	2.9 ± 0.8	32.6[f]
14	41N, 2E	<0.2	1.3 ± 0.5	6.7
B1	23.5N, 25E	24.7 ± 0.2	38.1 ± 1.1	705.0[e]
Guideline				30

[a]Refer to Figure 2.
[b]Subsurface soil; sampling depth approximately 0.5 m.
[c]Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.
[d]Calculated, utilizing U-234/U-235 activity ratio of 26.
[e]Exceeds guideline level regardless of statistical uncertainties.
[f]May exceed guideline level based on statistical uncertainties in analytical data.

TABLE 3

URANIUM CONCENTRATIONS IN SOIL FOLLOWING
ADDITIONAL REMEDIATION
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI

Sample[a]	Location	Uranium Concentration (pCi/g)		
		U-235	U-238	Total U[c]
3A	1.5N, 22.5E	0.3 ± 0.3[b]	<0.7	8.8
5A	20N, 25E	<0.2	2.1 ± 0.3	7.5
7A	40N, 25E	0.3 ± 0.1	<0.6	8.7
11A	57N, 0.5E	0.4 ± 0.1	2.4 ± 0.4	13.2
B1A	23.5N, 25E	0.8 ± 0.1	2.1 ± 0.4	23.7

[a]Refer to Figure 2.
[b]Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.
[c]Calculated, based on U-234/U-235 activity ratio of 26.