



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W.
ATLANTA, GEORGIA 30323

MAY 24 1988

Report No.: 50-124/88-01

Licensee: Virginia Polytechnic Institute
and State University
ATTN: Dr. A. K. Furr, Director
Health and Safety Programs
Poultry Science Building
Blacksburg, VA 24061

Docket No.: 50-124

License No.: R-62

Facility Name: Virginia Tech Argonaut Reactor

Inspection Conducted: April 4, 1988

Inspector:

George B. Kuzo
G. B. Kuzo

18 May 1988

Date Signed

Approved by:

C. M. Hosey
C. M. Hosey, Section Chief
Division of Radiation Safety and Safeguards

5-24-88

Date Signed

SUMMARY

Scope: This special, announced inspection involved confirmatory surveys of materials transferred from the Virginia Tech Argonaut Reactor (VTAR) facility to the Virginia Polytechnic Institute and State University (Virginia Tech) landrill as a result of decommissioning activities.

Results: No violations or deviations were identified.

REPORT DETAILS

1. Licensee Employees Contacted

- *A. Furr, Head, Department of Health and Safety
- *D. Smiley, Radiation Safety Officer

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on April 4, 1988, with those persons indicated in Paragraph 1 above. The inspector informed licensee representatives that radiation exposure levels measured at a one meter distance from the decommissioned reactor facility building materials met established NRC exposure criteria for unrestricted release. However, elevated exposure readings measured at contact for four specific areas located on large concrete building material sections indicated the need for further evaluation of surface contamination levels and, if necessary, additional remedial actions. Licensee representatives agreed to evaluate this issue, conduct required remedial actions, and report the results to the NRC Region II office in a timely manner. The licensee's remedial actions and results were forwarded to the NRC Region II office in a letter dated April 9, 1988. These results indicated that for the selected exposure and contamination surveys conducted, all material met the release criteria. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection.

3. VTAR Landfill Survey Results (83822)

During July 27-31, 1987, Oak Ridge Associated Universities (ORAU) performed a confirmatory radiological survey of the Argonaut Reactor Facility, Virginia Polytechnic Institute (VPI), Blacksburg, Virginia. This survey was conducted at the request of the NRC, Region II to verify the results of the licensee's final closeout survey report and to ensure that the remedial contamination levels are within the NRC guidelines for unrestricted use. Surveys were conducted at both the facility where the reactor was previously located and the VPI landfill which received concrete and other building material released as a result of decommissioning activities.

a. Oak Ridge Associated University (ORAU) Radiological Landfill Survey Results

Based on the ORAU, Confirmatory Radiological Survey of the Argonaut Reactor Facility, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, ORAU 88/A-74 dated January 1988, (Enclosure 2), the building housing the reactor was released for unrestricted use. However, radiological survey results for the

university owned landfill area which received building materials released from the VTAR reactor facility during decommissioning were inconclusive. At the time of the survey, exposure level measurements at one meter from the material surfaces could not be accurately measured due to shielding and geometry problems resulting from the location and positioning of large sections of the concrete material. The ORAU report listed several elevated exposure values measured at contact, ranging from 27 to 78 microroentgens per hour (uR/h), which could not be compared to the exposure level release criteria, that is, exposure values measured at one meter are required to be less than 5 uR/hr above background. In addition, two soil samples collected at the landfill and analyzed using gamma spectroscopy analyses indicated detectable concentrations of the following radionuclides: Co-57, 11 picocuries per gram (pCi/g); Co-60, 11 pCi/g; Eu-152, 30 pCi/g; and Eu-154, 23 pCi/g. The ORAU report concluded additional surveys were necessary for proper evaluation.

b. Virginia Tech Resurvey of Landfill

In a letter dated February 5, 1988, from D. C. Smiley, Virginia Tech, Radiation Safety Officer, to Mr. T. Michaels, NRR, radiation exposure data measured at selected areas at the landfill following rearrangement of the concrete sections to allow proper surveys were presented. The licensee data indicated that release criteria for exposure data measured at one meter from the surface of the concrete materials were not exceeded. Exposure values at one meter averaged 1.4 uR/hr above background levels.

- c. On April 4, 1988, an NRC Region II Facilities Radiation Protection (FRP) inspector conducted selected confirmatory exposure rate surveys at the Virginia Tech landfill area. At the time of survey, the inspector was accompanied by licensee representatives who conducted independent exposure measurements at each survey location. A total of 26 locations near concrete section surfaces were surveyed (Attachment 1). NRC results were measured using a Ludlum MicroR survey meter (Serial No. 575 calibrated November 9, 1987). In addition, four background radiation measurements were conducted north of the landfill area. Measurements were conducted at approximately 1 meter from the exposed surfaces of large sections of concrete material identified as originating from the VTAR facility. The measured exposure values did not exceed the specified release criteria of 5 uR/hr above background (Attachment 2). Exposure rates ranged from 7 to 12 uR/hr at one meter from the surfaces of the concrete material and background readings averaged 9.4 uR/hr. Licensee measurements were approximately half the NRC exposure values and followed the trends identified by the NRC.

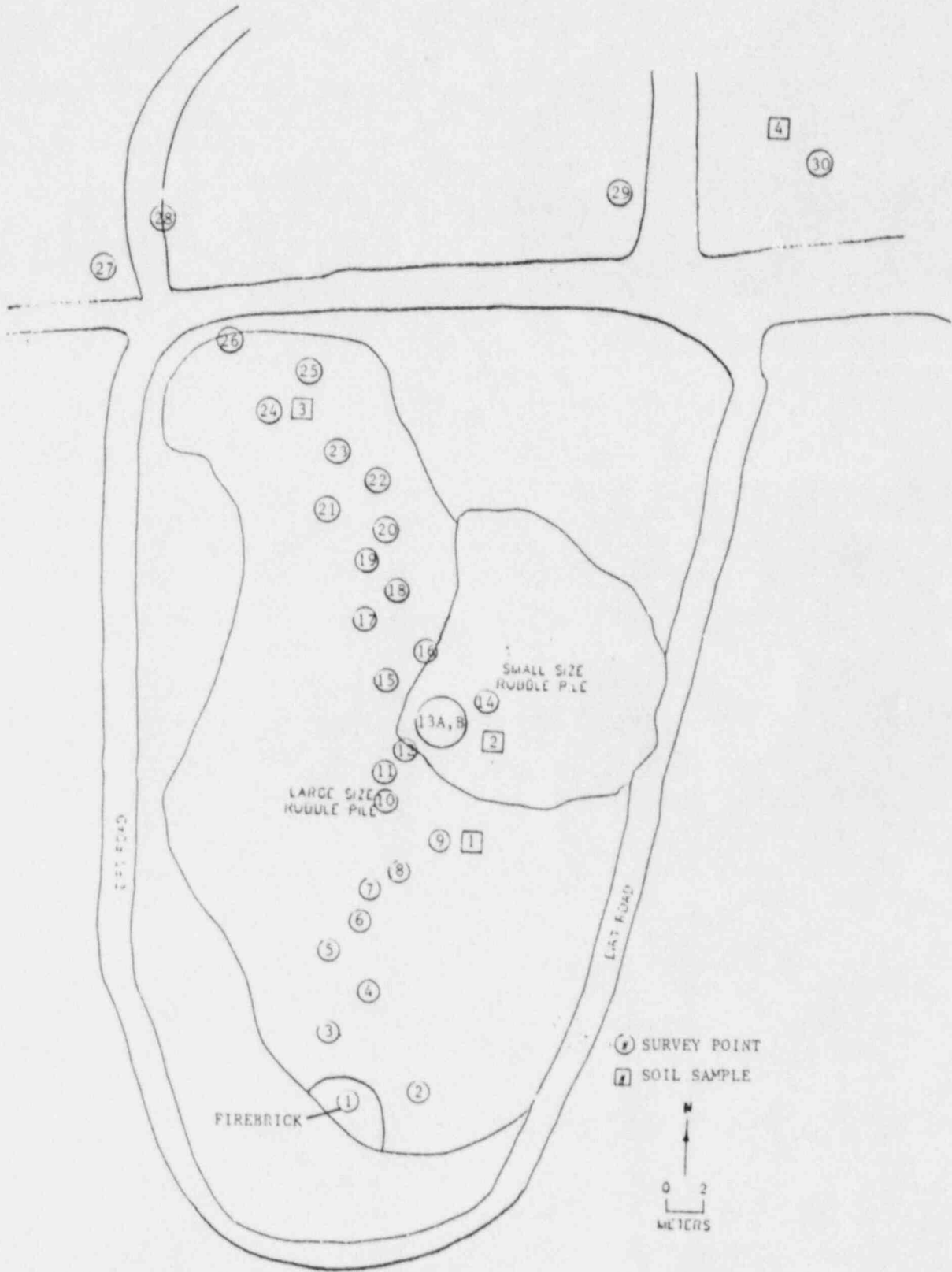
Specific areas of the concrete sections having elevated radiation levels measured at contact as identified in the ORAU confirmatory report were evaluated. The contact exposure measurement results are

listed in Attachment 3. Contact exposure rates as measured by the NRC and/or licensee were significantly elevated at survey locations 9, 13 and 24. The inspector requested the licensee to evaluate these areas to determine the levels of fixed contamination present. Each of the areas was to be evaluated to determine if the activity present in each area exceeded the release criteria of 15,000 disintegrations per 100 square centimeters (dpm/100 cm²) established for unrestricted release of material. The licensee agreed to conduct the additional surveys and stated that any remedial actions necessary to meet release criteria would be conducted in a timely manner. In addition, the licensee agreed to collect selected soil samples from near the locations where the ORAU surveys had identified elevated nuclide concentrations in the soil. The samples were to be collected and sent to the NRC Region II office for analysis.

On April 6, 1988, the licensee conducted additional contact contamination surveys of the concrete material. In a letter dated April 8, 1988, from D. C. Smiley, Virginia Tech, Radiation Safety Officer to NRC Region II, results of the contamination surveys of the concrete sections were detailed (Attachment 4). Licensee representatives surveyed all accessible surfaces of the concrete sections using RM-14 instrumentation, fitted with a HP-210 probe. Only 10% of the block surface at location No. 24 had contamination levels, 35,200 dpm/100 cm², which exceeded the release criteria. The contaminated surface material was chipped-away and disposed of as contaminated waste. Following this remedial action, the fixed contamination levels, 9600 dpm/100 cm², met the release limit criteria.

Radionuclide concentrations for the landfill and background soil samples collected are listed in Attachment 5. Because the ORAU soil sample locations were not marked and also concrete material in the landfill area was moved, the soil samples collected on April 6, 1988, may not represent the exact location previously sampled. The samples were analyzed using the NRC Region II gamma spectroscopy system. For the soil samples collected, all results were below instrument detection limits and similar to data observed for the background soil sample.

ATTACHMENT 1



VIRGINIA TECH LANDFILL SURVEY BY NPC/LICENSEE

ATTACHMENT 2

Exposure Rate (uR/hr) Survey* Results
for Virginia Tech Landfill

<u>**Location</u>	<u>EXPOSURE RATES</u>	
	<u>NRC</u>	<u>Virginia Tech</u>
1	12	5.5
2	8	3.5
3	8	3.5
4	8	3.5
5	7	4
6	7	3
7	7	4
8	7	3.5
9	-	4
10	8	4
11	5	3
12	6.5	3.5
13A	10	4.5
13B	6	3
14	8	4
15	5	2
16	7	3
17	8	2.5
18	7	2.5
19	7	4
20	6	2.5
21	7	4
22	7	3
23	8	4
24	7	4
25	7	3.5
26	8	3.5
27	9	5
28	9.5	4
29	9	3.5
30	10	4

*Exposure measurements conducted at one meter from material surface.

Survey points 27 through 30 were background exposure rate measurements.

Survey points 9, 13 and 24 correspond to ORAU confirmatory survey points 6, 5 and 7 respectively (ORAU 88/A-74).

ATTACHMENT 3

Comparison of Exposure Survey Results*
Measured at Contact for Selected Landfill Material

<u>Location</u>	<u>EXPOSURE RATES</u>		
	<u>NRC Results</u>	<u>Virginia Tech</u>	<u>ORAU**</u>
9	15	10	36
13a	10	25	78
24	30	15	27

*Survey Results are $\mu\text{R/hr}$.

**Survey points 9, 13, and 24 correspond to ORAU Confirmatory Measurements Survey Location Nos. 6, 5, and 7 respectively.

ATTACHMENT 4

Licensee Contamination Survey Results of
Selected Concrete Sections at Landfill

<u>Location</u>	<u>Area of Concrete Surface Surveyed</u>	<u>cpm</u>	<u>dpm/100 cm²</u>
9	< 10%	240	7680
9	> 90%	< 75	2400
13a	< 10%	400	12800
13a	> 90%	<100	3200
24	> 10%	1100	35200
24	< 90%	<100	3200
*24	NA	300	9600

*Resurvey of elevated contaminated area at Location #24 following remedial action by licensee.

ATTACHMENT 5

NRC Gamma Spectroscopy Analysis Results for Confirmatory
Soil Samples Collected at the Virginia Tech Landfill

<u>Sample location*</u>	<u>Isotope</u>	<u>Concentration, uCi/gm</u>
Soil Area #1	Co-57	< 3.1 E-8
	Co-60	< 7.3 E-8
	Cs-137	< 8.0 E-8
	Eu-152	< 9.2 E-8
	Eu-154	< 6.2 E-8
Soil Area #2	Co-57	< 3.4 E-8
	Co-60	< 6.1 E-8
	Cs-137	< 6.5 E-8
	Eu-152	< 9.9 E-8
	Eu-154	< 7.0 E-8
Soil Area #3	Co-57	< 4.0 E-8
	Co-60	< 1.0 E-7
	Cs-137	< 7.7 E-8
	Eu-152	< 1.2 E-7
	Eu-154	< 8.0 E-8
**Soil Area #4	Co-57	< 3.2 E-8
	Co-60	< 8.2 E-8
	Cs-137	< 1.5 E-7
	Eu-152	< 9.5 E-8
	Eu-154	< 6.6 E-8

*See Attachment 1 for soil sample locations

**Represents soil from background area location