



040-08976

**Westinghouse
Electric Corporation**

Westinghouse Building
Gateway Center
Pittsburgh Pennsylvania 15222

September 23, 1991

United States Nuclear
Regulatory Commission
Region 1
475 Allendale Road
King of Prussia, PA 19406
Attention: John D. Kinnemann

License No. SMB-1527
Docket No. 040-08976

Dear Mr. Kinnemann:

Your letter of April 29, 1991, indicated that your contractor, Oak Ridge Associated Universities (ORAU), found residual radioactivity in both remediated and non-remediated areas of the Westinghouse facility at Bloomfield, New Jersey. You requested the results of our confirmatory measurements, a summary of additional remediation performed when necessary, and assurances that other areas are not contaminated. In addition, you requested information on five other topics which would assist in your review.

The areas containing residual contamination as reported by ORAU, are discussed below.

Exterior

The single elevated reading was confirmed and approximately 12 cubic feet of soil and sediment removed. During confirmatory measurements, a second spot containing a single jar of thorium nitrate was detected and removed.

Bldg. 2, 1st Floor

Six small, isolated spots were found to contain Ra-226 exceeding release criteria (no removable contamination found). The total contaminated area was less than 20 square feet. Follow-up surveys identified an additional area of

112591
9/25/91

September 23, 1991
Page 2

200 square feet requiring remediation. All areas have been cleaned and cleared for release.

Bldg. 2, 2nd Floor

The Moly Ribbon Room, a remediated area, was found to have residual contamination. Several spots at the base of the door, the base of a pillar, and a spot on the wall were verified as exceeding criteria and cleaned by removal and vacuuming. An estimated 20 square feet was remediated.

Bldg. 3, 1st Floor

A corridor approximately 150 feet long was determined to contain uranium contamination. Verification measurements showed that while levels were generally elevated, actual readings exceeding criteria were very spotty and randomly distributed. Since it was more expeditious to perform large area surface removal than to locate and clean specific spots, the surface of the entire corridor was removed. A survey to confirm decontamination identified an additional 20 to 30 feet to be cleaned. The entire area was remediated and a confirmatory survey performed.

Bldg. 3, 1st Floor

A 10 foot storage area adjacent to the corridor was confirmed to be contaminated. The wooden flooring and the surface of the underlying concrete were removed and the area vacuumed. A confirmatory survey indicated decontamination was complete.

Bldg. 3, 3rd Floor

A lab room was reported to have elevated readings throughout. Our confirmatory survey found only a single area approximately two feet by two feet, which was removed. All other readings are due to elevated background levels from wall materials containing natural radioactive materials, e.g. potassium, and do not exceed release criteria.

Bldg. 4, 1st Floor

A 36 square foot section of floor in the carpentry shop was confirmed as exceeding criteria and was removed.

Bldg. 4, 2nd Floor

A two square foot area in the machine shop was vacuumed to remove loose contamination beneath the wood flooring.

Bldg. 4, 2nd Floor

A four square foot area in the plating room was confirmed to have spots exceeding criteria. The concrete surface was chipped and vacuumed to meet release limits.

Bldg. 3, 4 and 5 Loading Dock

Elevated readings were reported in this area, which had been previously remediated. A confirmatory survey failed to detect any readings exceeding uranium release criteria, although readings above ambient background were confirmed. No follow-up remediation has been performed in this area.

Bldg. 6 - Floor

Several isolated spots were reported in this building. Based on this report, the WEC contractors completed a 100% resurvey of the floor, identifying an additional five spots. All areas were cleaned by removing the concrete top surface. A total of about 200 square feet of surface plus soils were removed to meet release criteria.

The additional remediation required to address areas identified by ORAU and confirmed by WEC contractors (see Attachment 2) was completed in approximately 14 days.

Of the 22 individual remediated areas previously cleared by WEC, only two were found to contain residual contamination exceeding criteria; the single location in the reservoir and several small spots in the Moly Ribbon Room, Building 2. All other remediated areas have been verified to meet release criteria.

The remainder of areas requiring clean-up were found in non-remediated locations (see Attachment 3). These were not identified during the initial site characterization, since it was stated that radioactive materials had never been used in these areas. On that basis, only a random, walk through survey had been performed. Since the ORAU survey identified residual contamination levels, the WEC contractors have performed a complete survey of all non-remediated areas which were not surveyed by ORAU. These surveys identified several small areas of residual contamination which required remediation. These areas included a 100 square foot area in an office on the second floor of Building 1, an additional area on the first floor of Building 1, and a small area on the fourth floor of Building 3. All locations have been remediated for release. All other locations have been found to be free of contamination. We believe this procedure is adequate to assure that all areas in Buildings 1 through 6 meet release criteria.

September 23, 1991
Page 4

Other information requested in your letter:

1. A total of 53 waste shipments have been made through March 1991. These shipments total 44,000 cubic feet of waste containing 317 millicuries of thorium and uranium contamination. Approximately 30% of this waste originated from Buildings 1 through 6.
2. Several hazardous materials, including mercury and cadmium, have been encountered during work at the Bloomfield site. Radioactive waste containing mercury has been generated in a number of areas. In each case, these wastes were sampled and the samples sent off-site for laboratory analysis. All samples passed the EPA TCLP tests; thus, they were not considered hazardous wastes. At this time, one drum of oil containing PCB's and several jars of mercury are being stored on-site pending analysis for radioactivity content.
3. WEC believes there is little risk of radiological contamination of ground water at this time. All known exterior contaminated soils have been excavated and disposed. It is possible that small volumes of contaminated soils from broken pipes and drains remain beneath Building 9, and possibly Building 7. Use of these systems was terminated at least ten years ago and there is little likelihood that any of this contamination could migrate into the ground water.

Groundwater monitoring wells have been in place at Bloomfield for many years. Periodically, these wells have been sampled for radioactivity. Results from sampling performed in 1987 and 1990 show no indication of contamination of ground water from Bloomfield site operations (see Attachment 4). WEC has recently implemented a new ground water sampling program to meet the State of New Jersey requirements. This program will include gross alpha, gross beta, gross gamma and total uranium analyses.

4. Work performed at Westinghouse involved preparing high purity uranium metal from various forms of uranium powders such as the oxides, chlorides or fluorides (potassium uranous fluoride). These powders were produced on-site by a photo-chemical reduction of uranyl salts. The uranyl salts, (e.g., uranyl nitrate) were likely produced from U_3O_8 ("yellow cake") either on-site or immediately prior to receipt.

There is no indication that raw ores were shipped on-site nor is there any evidence that uranium was extracted from ores, on-site. Although very small, isolated spots of Ra-226 contamination have been found in two areas, no residues resembling "tails" have ever been identified at the Bloomfield site. There is no reason to believe tailings may be present off-site.

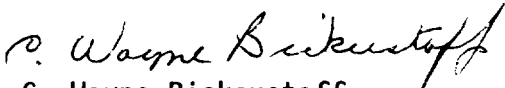
September 23, 1991
Page 5

Initial surveys were conducted at locations immediately adjacent to the Westinghouse site (i.e., outside fence line) and no radioactivity was found.

5. See Attachment (1) for the derivation of the minimum detectable activity (MDA) as quoted in our May 1990 survey report.

Westinghouse Electric Corporation (WEC) hereby requests release of Buildings 1-6, the garage and property on the west side of Arlington Avenue at 1 Westinghouse Plaza, Bloomfield, NJ. As you know, remediation will continue in the properties on the east side of Arlington Avenue, and a final survey for these areas will be completed in the near future.

If you have any questions, please call me at 412/642-3880, or Lee Booth, Canberra Industries, 708/285-3030.



C. Wayne Bickerstaff
Radiation Safety Officer
Manager, Industrial Hygiene and
Materials Transportation
Environmental Affairs

- Attachments:
- (1) Derivation of the MDA.
 - (2) Survey results: Areas found by ORAU and remediated by WEC (or not).
 - (3) Survey results: Additional non-remediated areas surveyed by WEC and remediated.
 - (4) Ground water sampling results.

cc: Arnold Gray, New Jersey Department of Environmental Protection

ATTACHMENT 1: Derivation of system MDA's

The MDAs quoted in our May, 1990 survey results were derived as follows:

For removable alpha and beta activity, paper filter wipes of 100 square cm areas were collected and counted on a low background alpha-beta proportional counter. The MDA depends on the background, time counted and efficiency. Typical values would be:

	<u>BKG</u>	<u>EFF</u>	<u>TIME</u>	<u>MDA</u>
alpha	0.1 cpm	0.22	2 min.	3.0 dpm/100cm ²
beta	0.8 cpm	0.25	2 min.	7.6 dpm/100cm ²

$$\text{where} \quad \text{MDA} = 3 \sqrt{\frac{\text{CPM}}{t_{\text{eff}}}}$$

The following calculation can be used for the portable survey instrument readings. For gross beta (total beta), the typical values are:

bkg	40 cpm
eff	0.22
probe area	16 cm ²

We assume the system MDA may be approximated by the standard error of the meter reading. The standard error, σ , of an instantaneous reading of a mean-level ratemeter may be calculated from:

$$\sigma = (r^2 RC)^{-1/2} \times 100 \quad (1)$$

where r = detector input, cps
 R = meter circuit resistance
 C = meter circuit capacity

NOTE: RC = "RC time constant"

(1) Price, Nuclear Radiation Detection, pp

For a background count rate of 40 cpm and a time constant of four seconds (provided by Ludlum for a Model 12 rate meter),

$$\begin{aligned} \sigma &= [(0.67) (2) (4)]^{-1/2} \times 100 \\ &= 43\% = 17 \text{ cpm} \\ &= 510 \text{ dpm/100 cm sq} \end{aligned}$$

The values shown in the report were erroneously reported as less than 200 dpm/100 square cm. They should have been 500 dpm/100 square cm.

Please note that some users recommend the use of:

$$\text{LLD} = \frac{2.71 + 4.66 S_B}{(\text{eff})(\text{geometry})}$$

We believe this a priori method is not appropriate for mean-level rate meters and does not represent actual detection capabilities. In our experience, a careful technician can easily discern count rates equal to three times S_B for mean level systems. Use of the LLD formula yields a value of 900 dpm/100 square cm. It can be seen that either method yields a detection limit less than the most restrictive release criteria; i.e., 1000 dpm/100 square cm. for thorium.

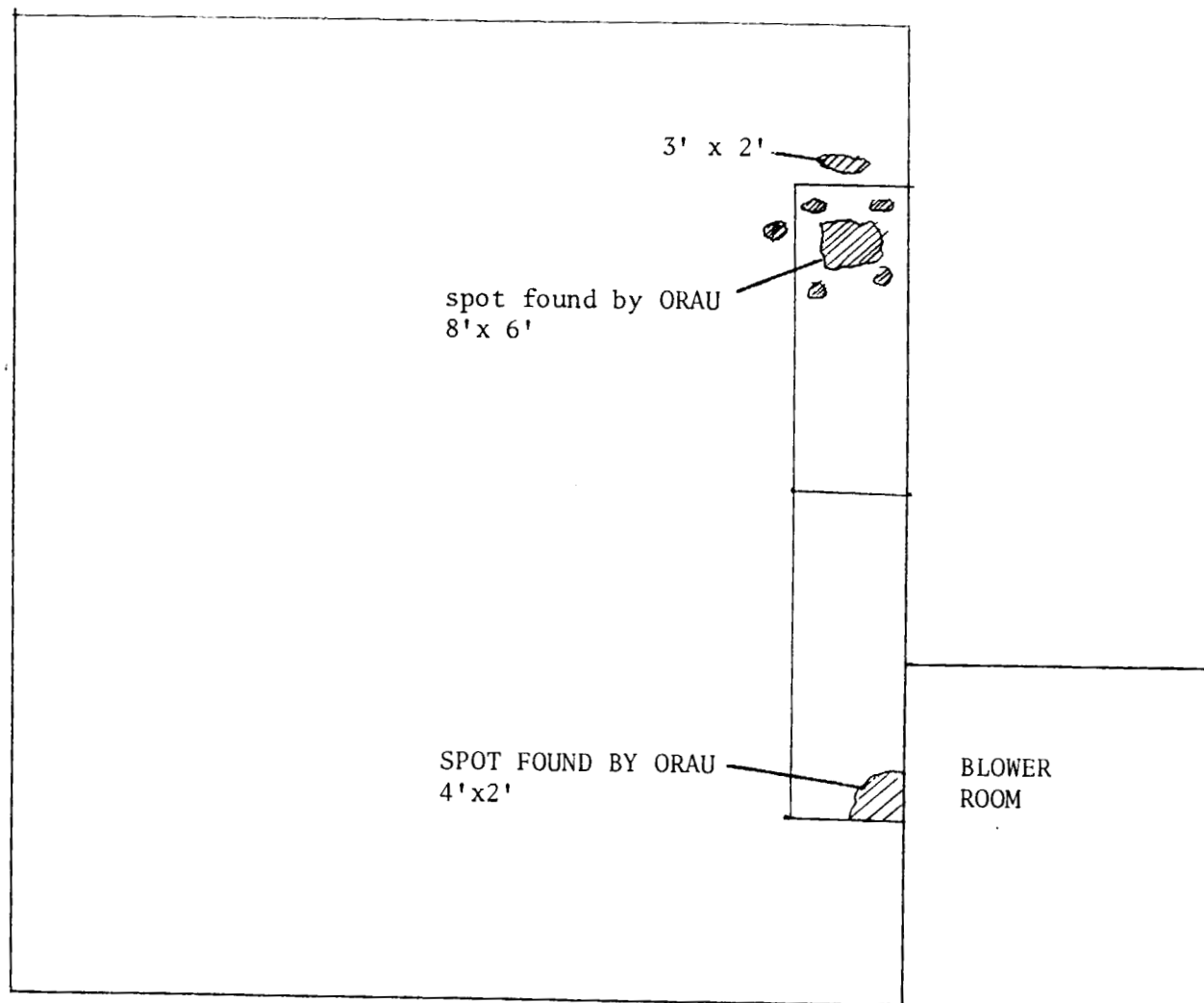
**ATTACHMENT 2: Survey Results: Areas found
by ORAU and remediated by WEC**

Location BUILDING 2 1st FLOOR

Date 6/10/91

Surveyor ROB MADDOX

Instruments LUBLUM FLOOR MONITOR

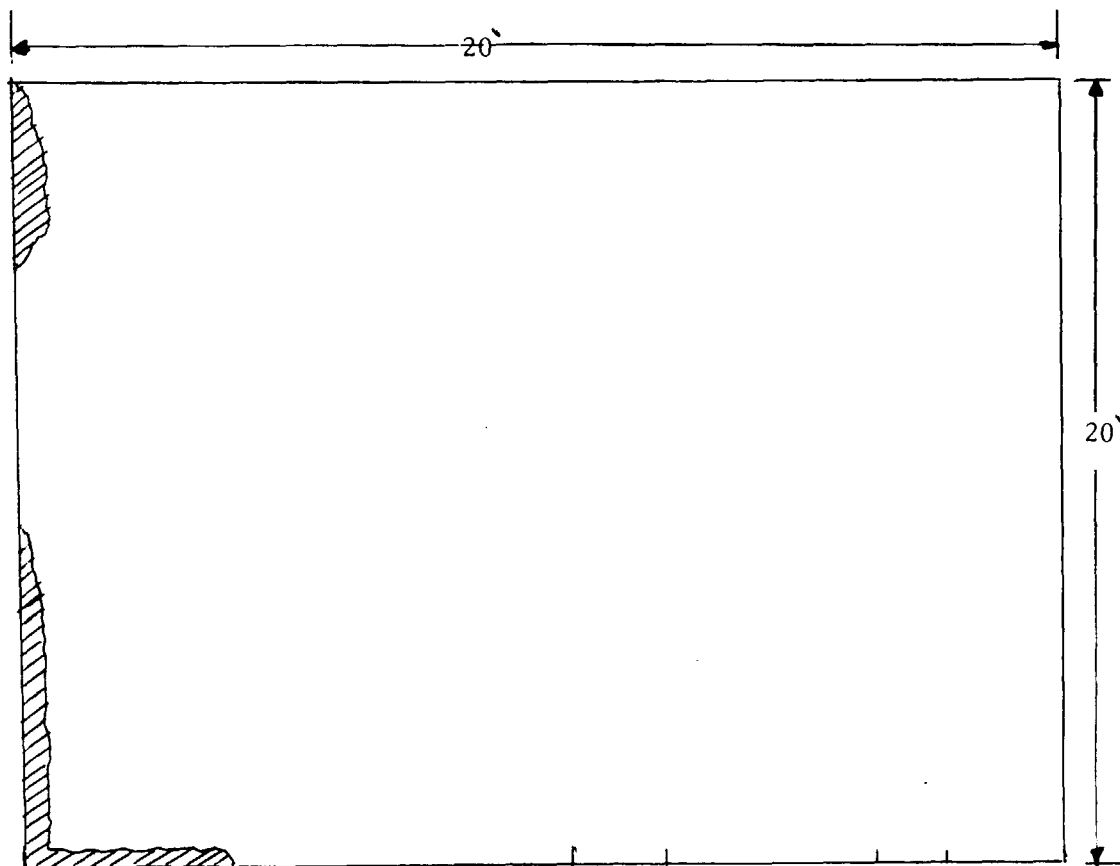


Comments ISOLATED SPOTS ON FLOOR Ra-226 1000 pCi SPOTS CLEANED AND RELEASED

Location BUILDING 2 2nd FLOOR MOLY RIBBON ROOM

Date 6/10/91 Surveyor ROB MADDOX

Instruments LUDLUM FLOOR MONITOR



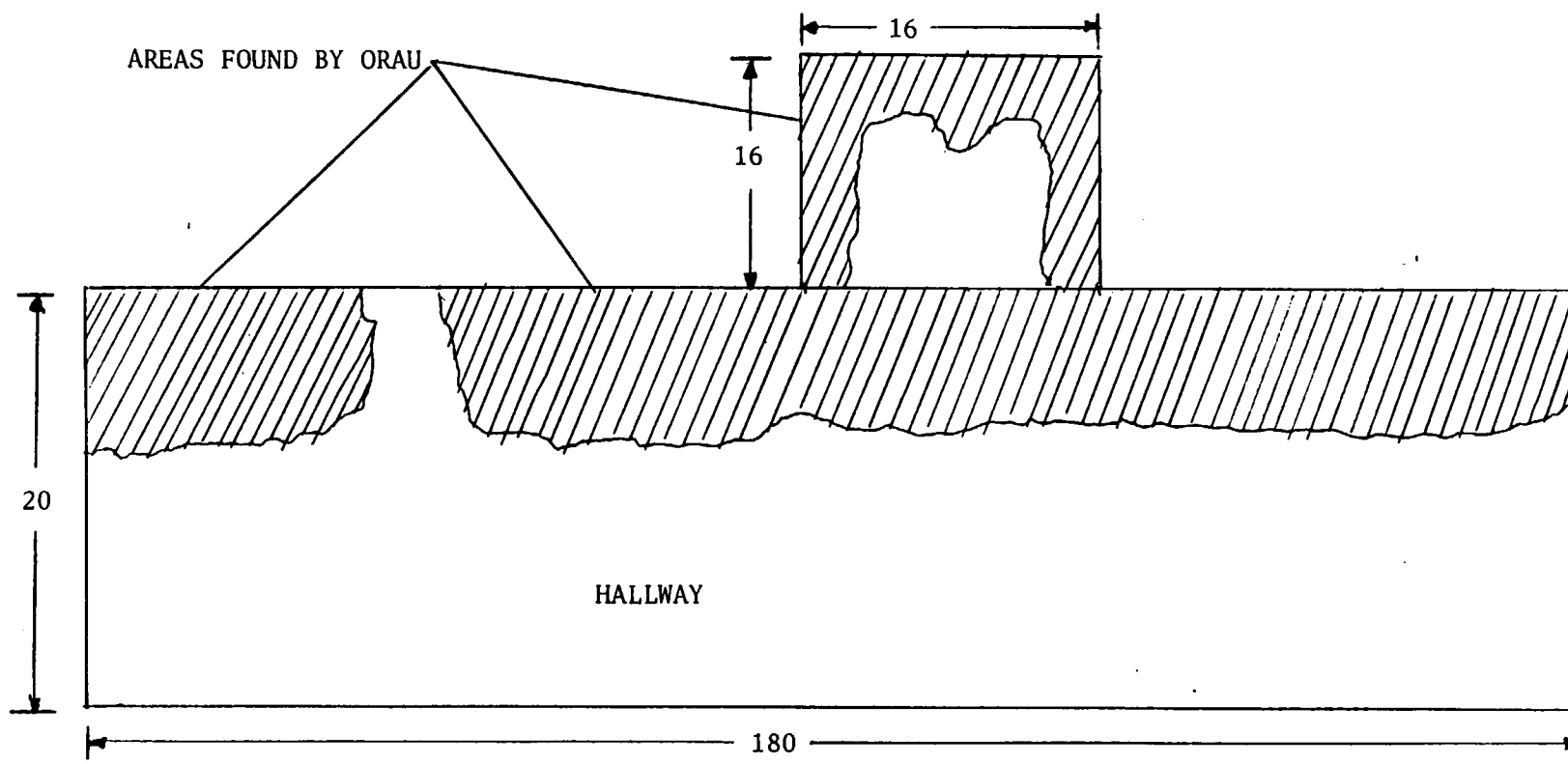
AREA WAS PREVIOUSLY REMEDIATED BY S.E.G.

Comments ACTIVITY WAS FOUND ALONG BASEBOARDS BY ORAU. AREA WAS SAND BLASTED AND VACUUMED: RESURVEYED BY CANBERRA.

Location BUILDING 83 1st FLOOR HALLWAY AND ROOM

Date 6/10/91 Surveyor ROB MADDOX

Instruments LUDLUM FLOOR MONITOR



U-238 SMALL SPOTS ON FLOOR SOME ABOVE 5000 dpm/100cm². NO REMOVEABLE ACTIVITY.

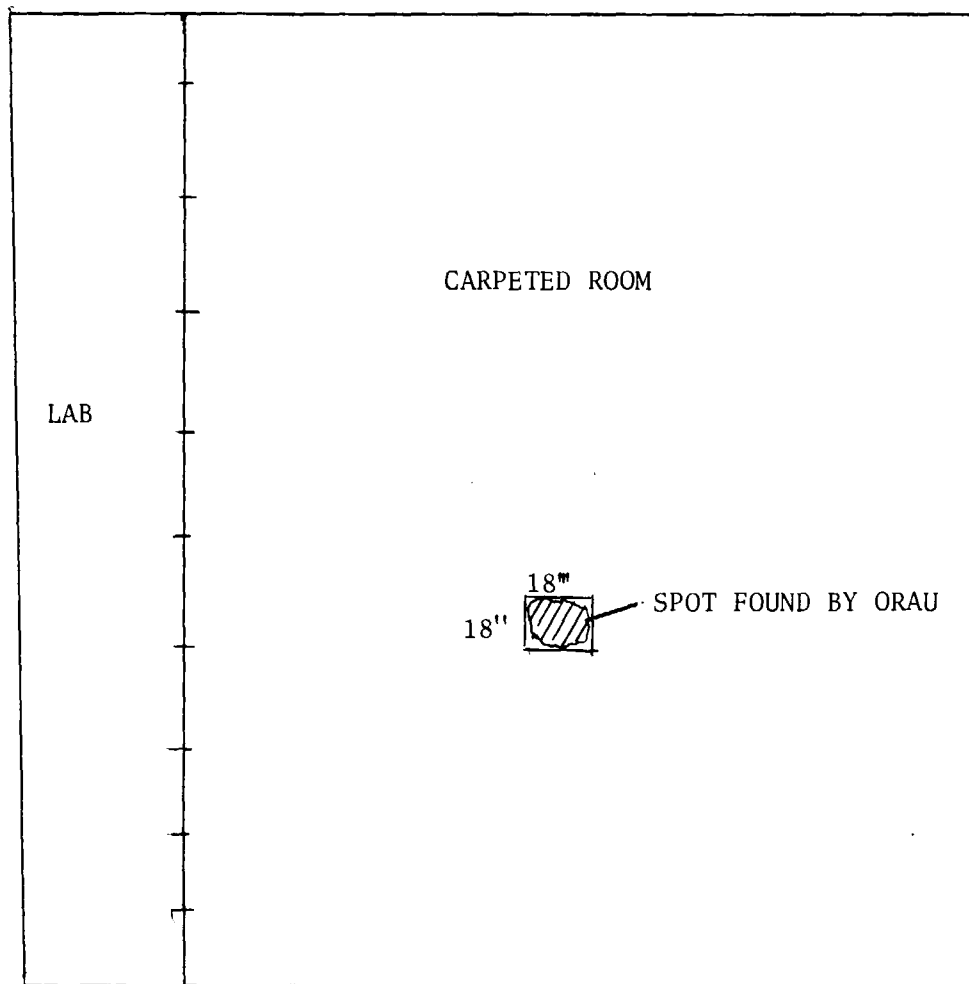
Comments HALL CONTAMINATED ALONG WITH SMALL ROOM ADJACENT TO HALL. HALLWAY WAS SCABBLED AND WOOD FLOOR REMOVED FROM ROOM.

Location BUILDING 3 3rd FLOOR

Date 6/10/91

Surveyor ROB MADDOX

Instruments *LUDLUM FLOOR MONITOR



Comments SPOT FOUND UNDER CARPET U-238 ACTIVITY 120 pCi/gm SPOT REMOVED AND RELEASED

Location BUILDING 4 1st FLOOR CARPENTRY AREA

Date 6/10/91 Surveyor ROB MADDOX

Instruments LJDLUM FLOOR MONITOR



spot found by ORAU

Comments U-238 4700 pCi WOOD FLOORING REMOVED AREA VACUUMED

Location BUILDING 4 2nd FLOOR WEST END

Date 6/10/91

Surveyor ROB MADDOX

Instruments LUDLUM FLOOR MONITOR

OFFICIAL RECORD CO. ML 10

Area found by ORAU
2'x2'

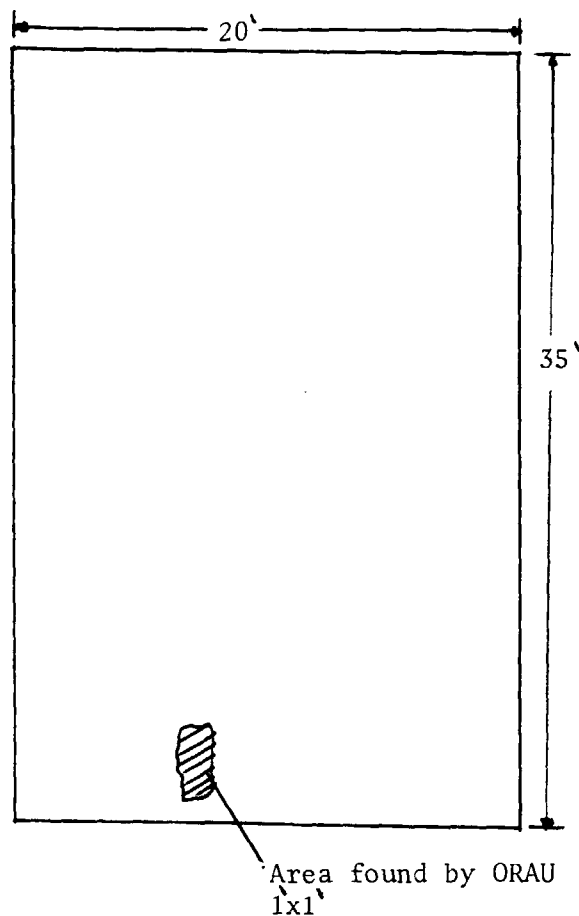


Comments DIRT SAMPLE UNDER FLOOR BOARDS, Th-232 10,000 pCi DIRT VACUUMED AND RELEASED

Location BUILDING 4 2nd FLOOR PLATING ROOM

Date 6/10/91 Surveyor ROB MADDOX

Instruments LUDLUM FLOOR MONITOR



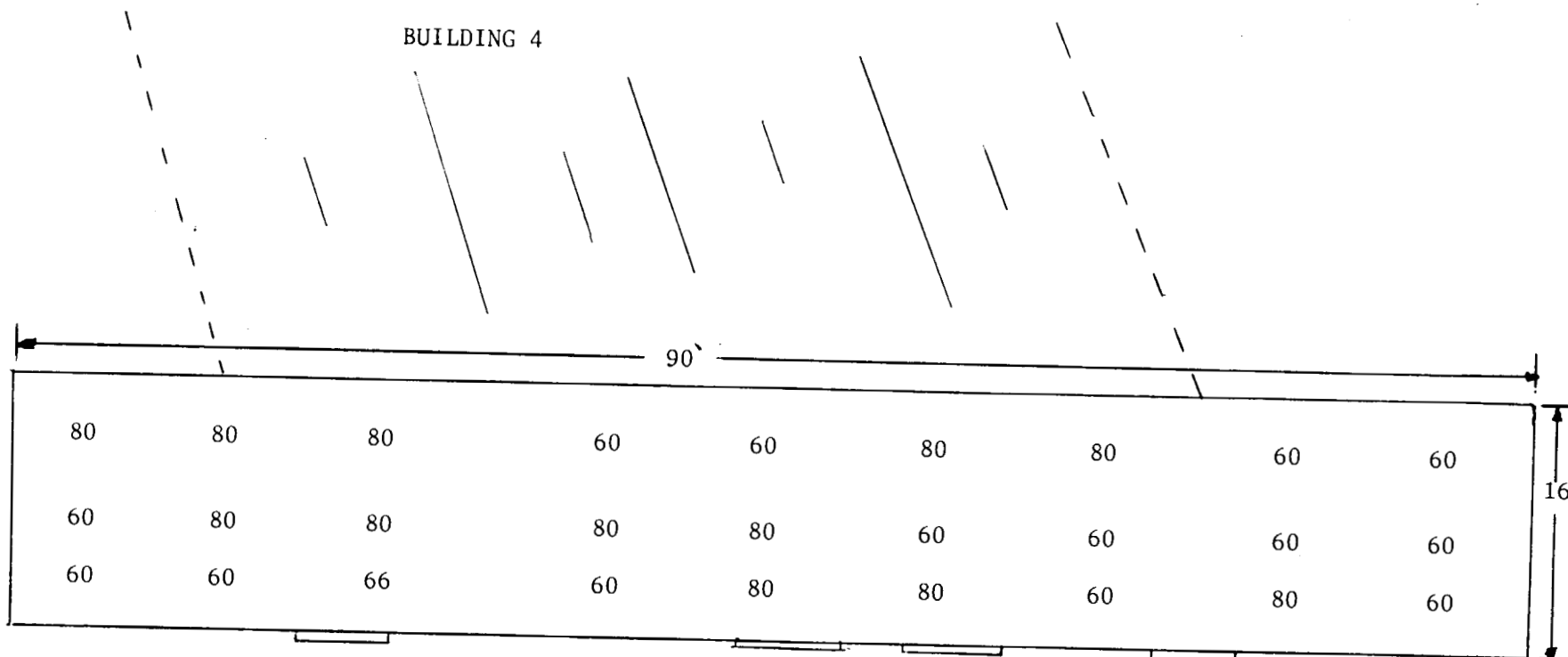
Comments CONCRETE CHIPS FROM SMALL AREA SHOWED TRACE URANIUM AND THORIUM AREA FOUND TO MEET CRITERIA

Location BUILDING 4 LOADING DOCK

Date 6/10/91

Surveyor ROB MADDOX

Instruments LUDLUM MODEL 12 WITH GM PANCAKE



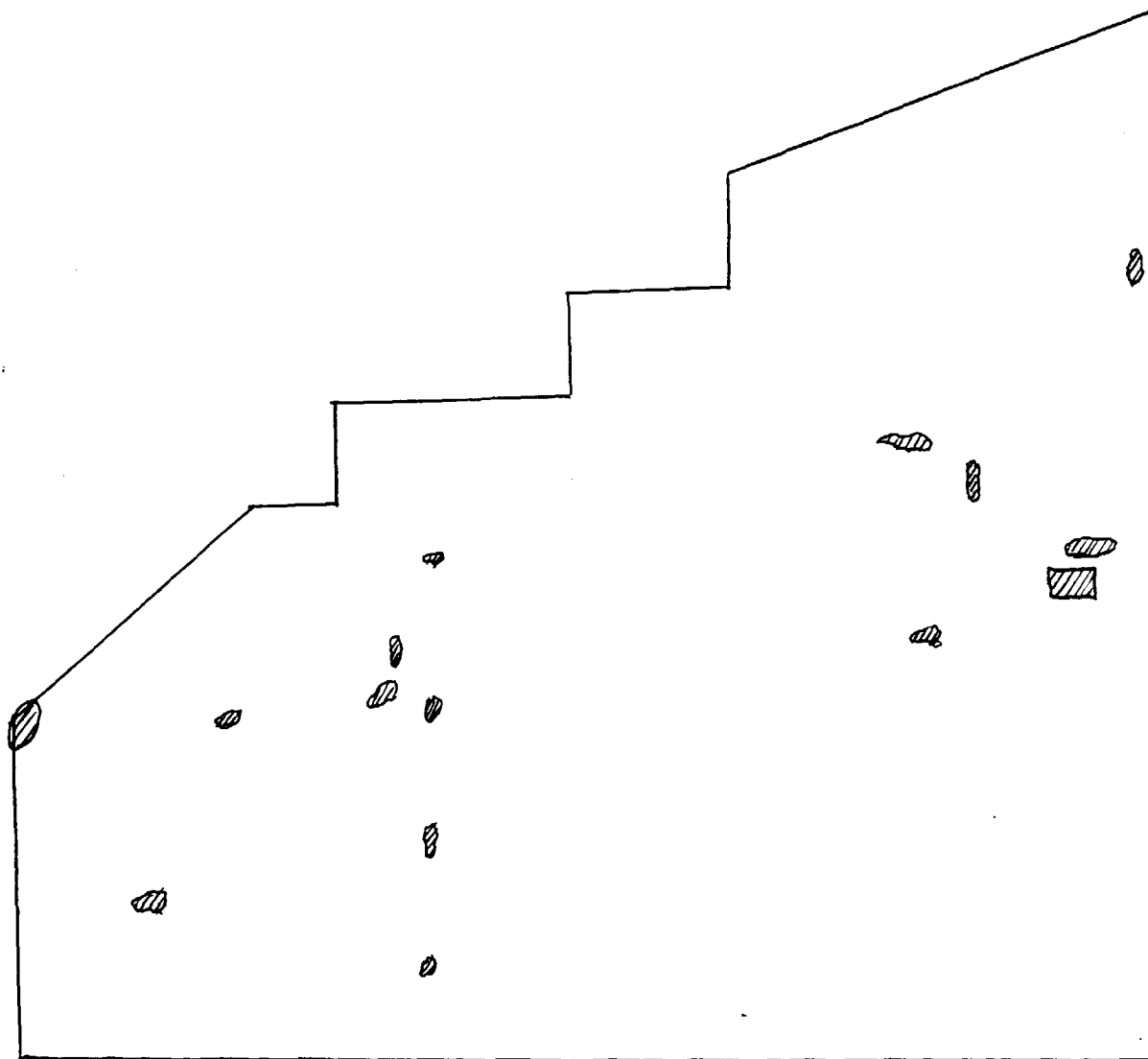
Comments AREA FOUND BY ORAU. CONFIRMED TO BE BELOW CRITERIA FOR URANIUM.

Location BUILDING 6

Date 6/10/91

Surveyor ROB MADDOX

Instruments LUDLUM FLOOR MONITOR



Comments Th-232 activity at 8pCi/gm various small spots with surface contamination Spots removed and cleared

ATTACHMENT 3: Survey Results: Additional
non-remediated areas found and remediated by WEC

Location BUILDING #1 1st FLOOR LOCKED ROOM

Date 6/12/91 Surveyor RICH MILLER

Instruments LUDDLUM MODEL - 12

SHADED SPOT SUSPECTED TO BE THORIUM. ACTIVITY 10,000 DPM/100 SQ CM

TO BLDG #2

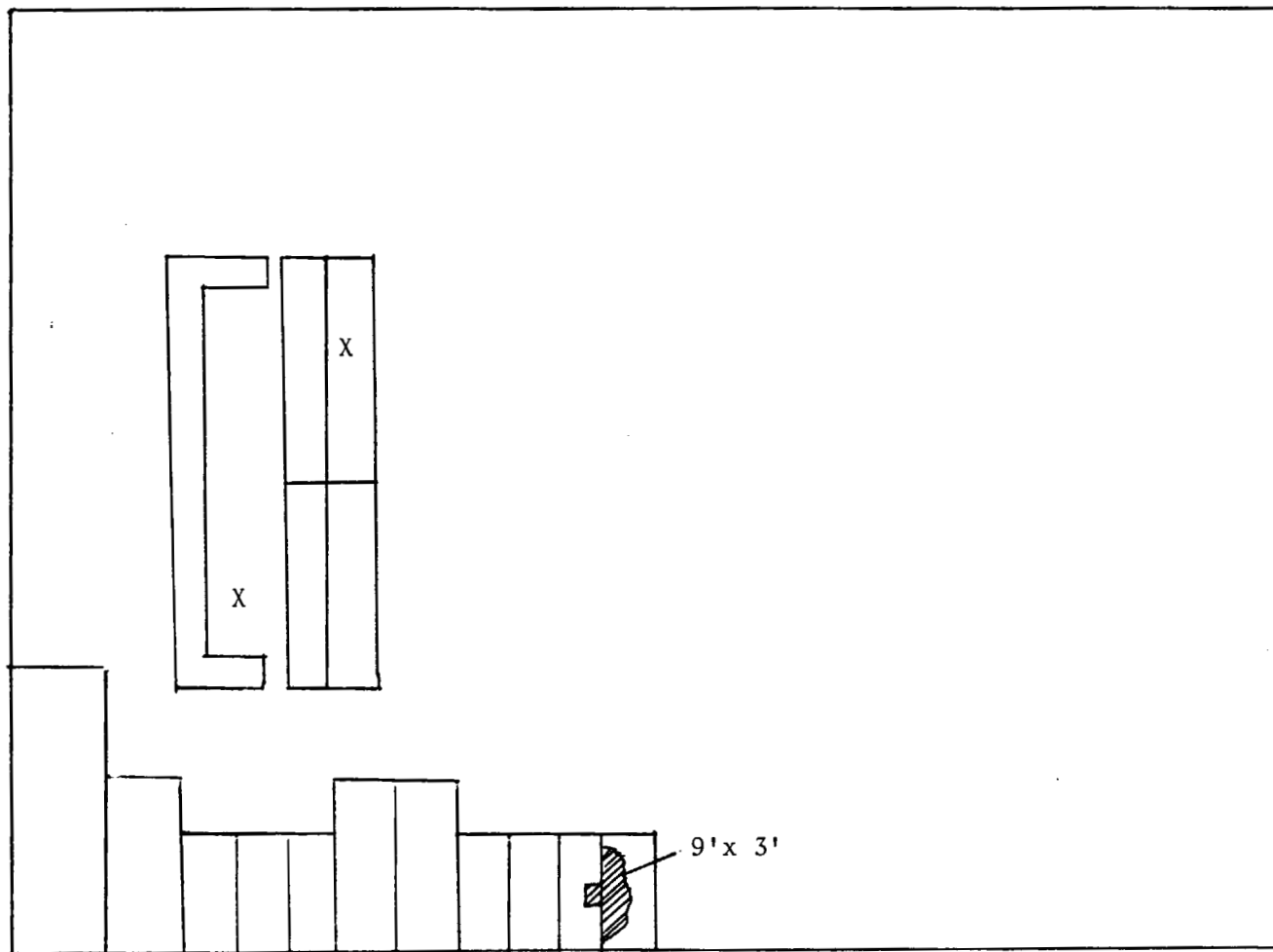


Comments CONTAMINATION FOUND TO BE URANIUM WHEN REMEDIATION WAS STARTED. MOST OF AREA CLEANED TO BACKGROUND
SOME SPOTTY ACTIVITY (HIGHEST AT 300 GROSS CPM) REMAINING BUT ALL IS WITHIN URANIUM CRITERIA 8/14/.

Location BUILDING 1 2nd FLOOR OFFICE

Date 6/12/91 Surveyor RICH MILLER

Instruments LUDLUM 12



Xs REPRESENT ELEVATED READINGS BUT NOT OVER CRITERIA.

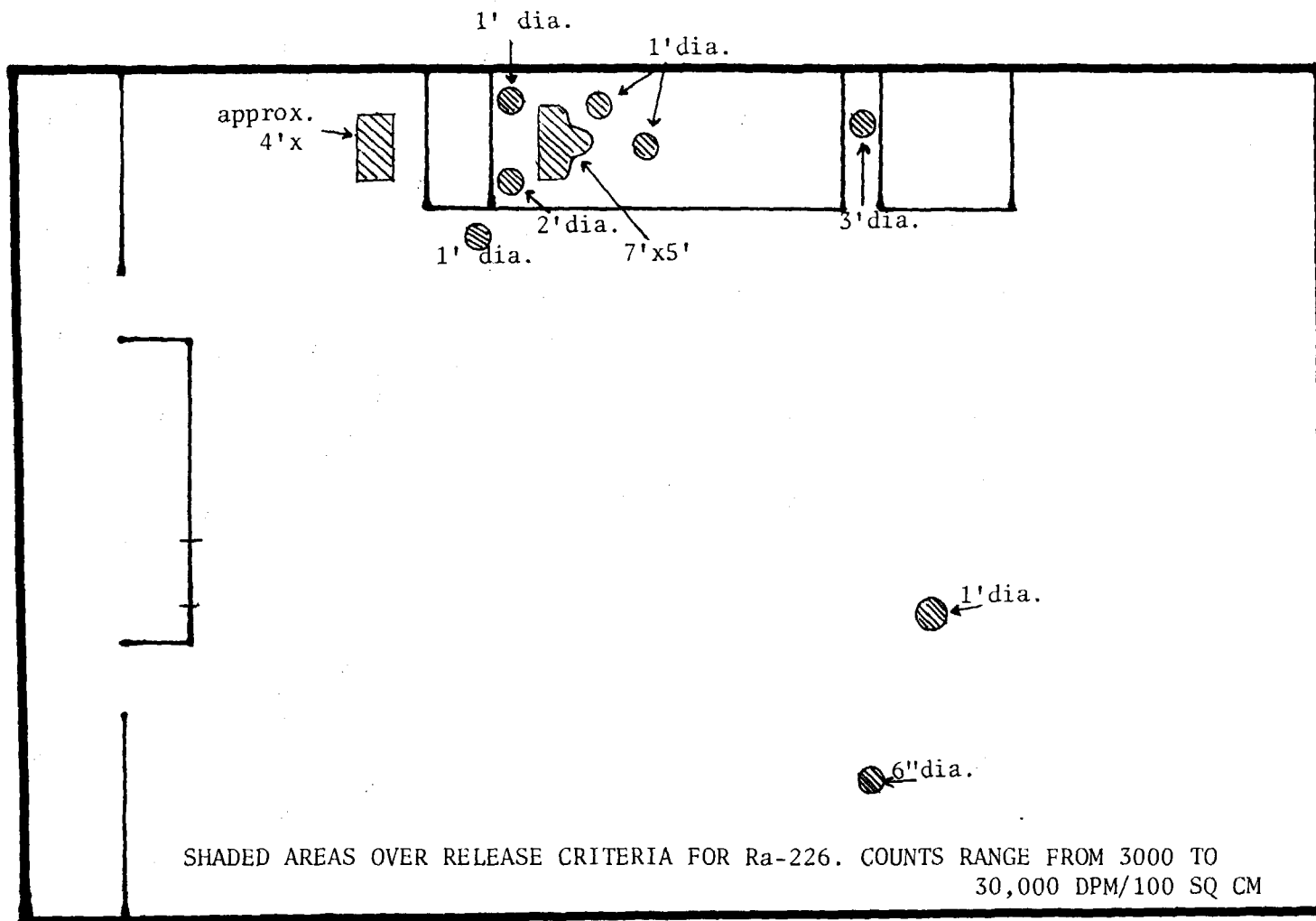
Comments COUNTS RANGE FROM 150 cpm to 2800 cpm. SHADED AREA IS OVER CRITERIA FOR THORIUM.
AREAS CLEANED TO REL' Y CRITERIA 8/15/91

Location BUILDING #2 1st FLOOR

Date 6/12/91

Surveyor RICH MILLER

Instruments LUDLUM MODEL - 12



TO BLDG #3



Comments

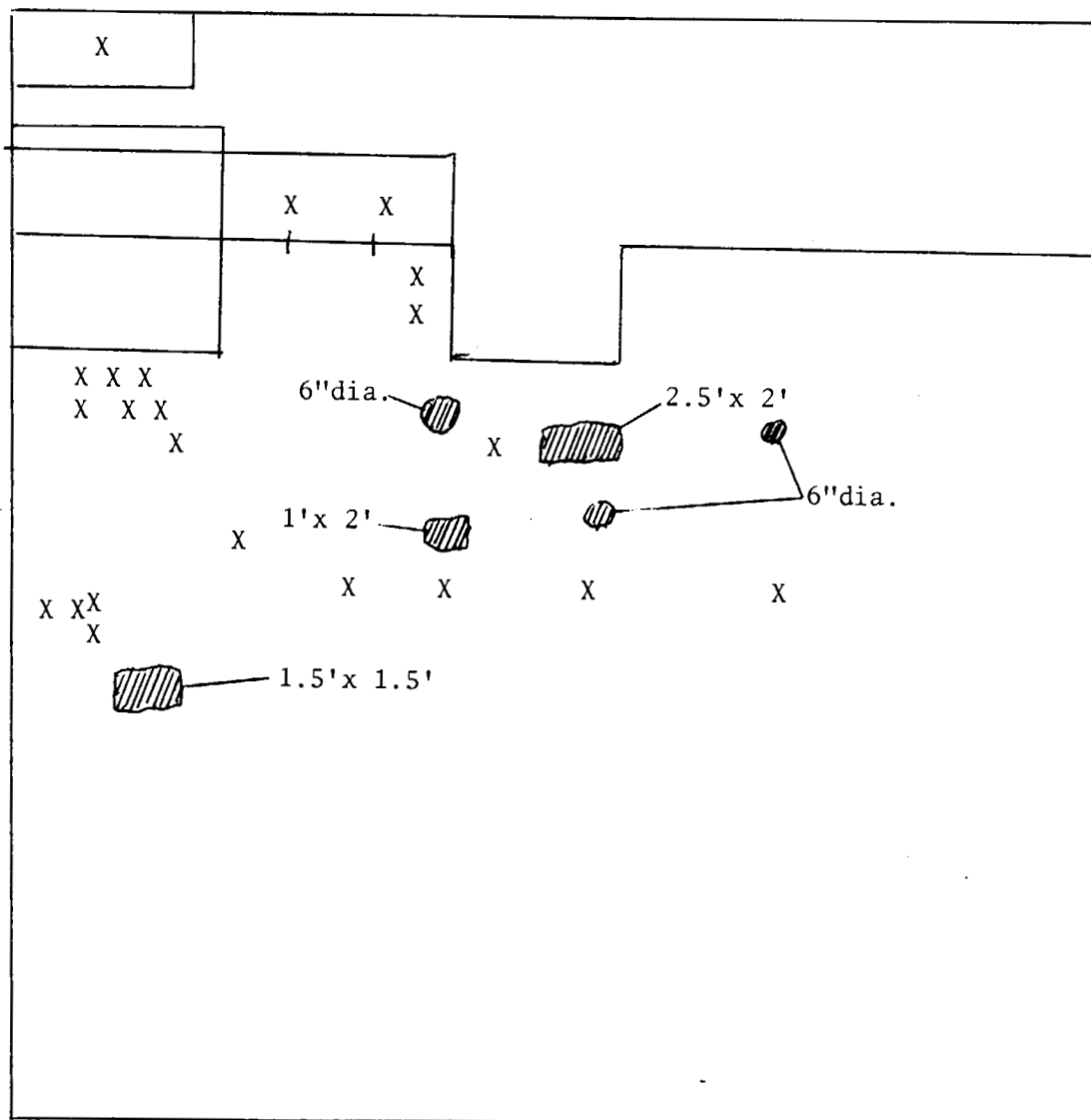
CHECKED & RELEASED BY ROB MADDOX (CI)

Location BUILDING 2 2nd FLOOR

Date 6/12/91

Surveyor RICH MILLER

Instruments LUDLUM 12



Xs REPRESENT ELEVATED READINGS BUT NOT OVER CRITERIA.

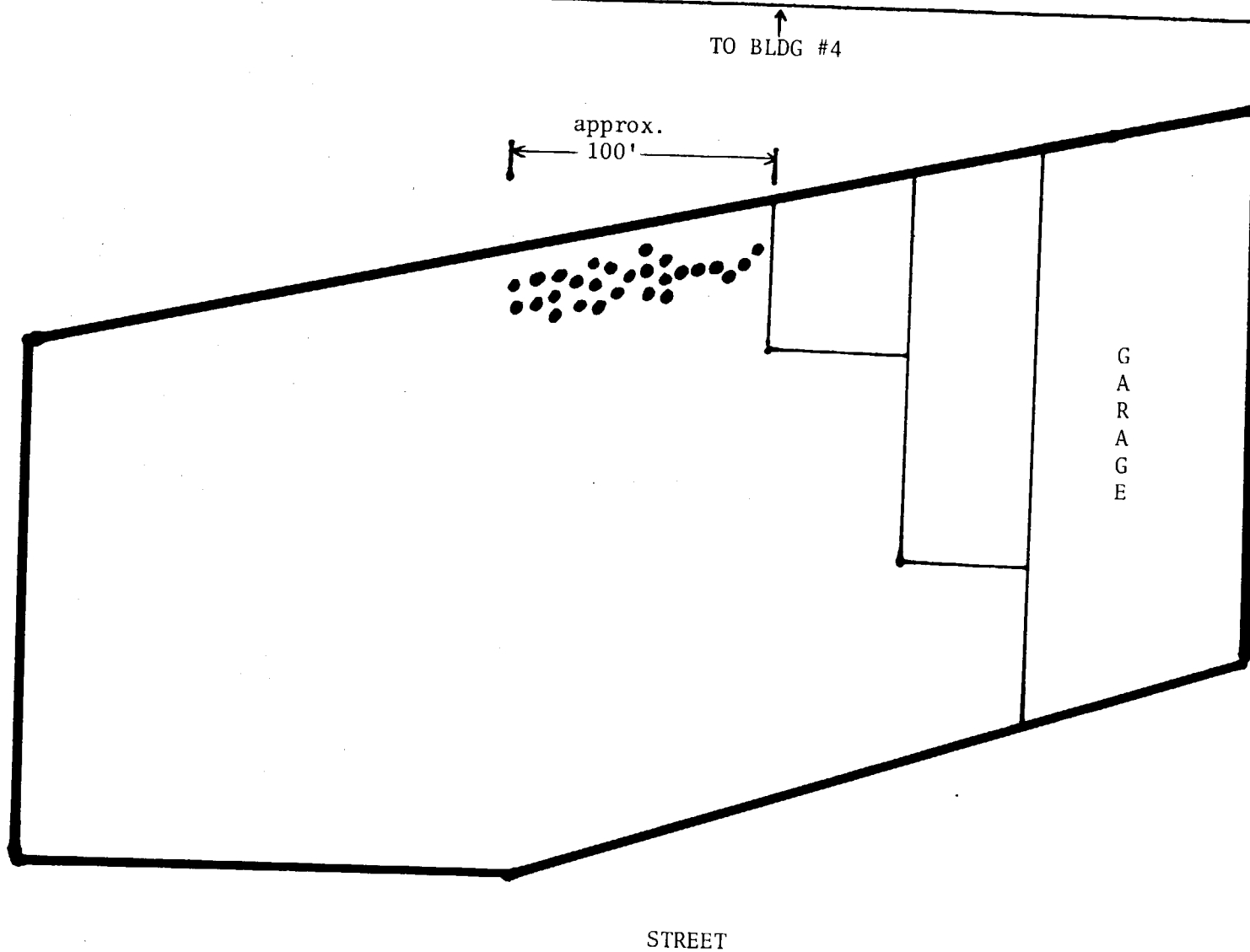
Comments SHADED AREAS ARE OVER CRITERIA FOR THORIUM. COUNTS RANGE FROM 200 cpm to 1100 cpm

CHECKED AND RELEASED BY MADDOX AUG, 91

Location BUILDING #3 1st FLOOR

Date 6/12/91 Surveyor RICH MILLER

Instruments LUDLUM MODEL-12



Comments AREA REMEDIATED TO NO ACTIVITY >120 GROSS CPM SURVEYED BY WALT TOMLINSON 8/8/91

Location BUILDING #3 4th FLOOR

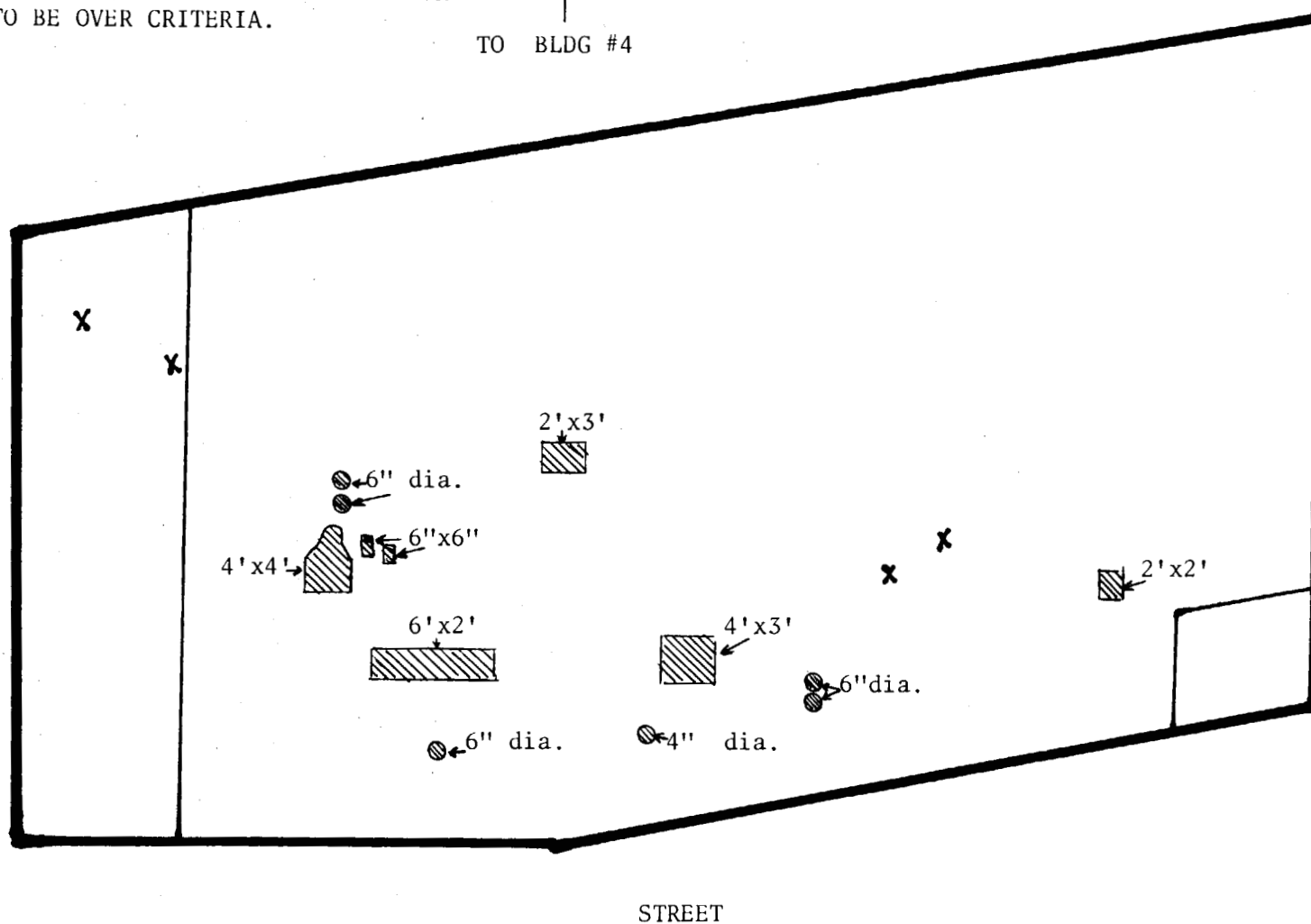
Date 6/12/91

Surveyor RICH MILLER

Instruments LUDLUM MODEL-12

SHADED AREAS REPRESENT AREAS OVER CRITERIA
FOR THORIUM COUNTS RANGE FROM 200 CPM TO 400 CPM
X's REPRESENT AREAS FOUND BY THE FLOOR MONITOR
BUT FOUND NOT TO BE OVER CRITERIA.

↑
TO BLDG #4



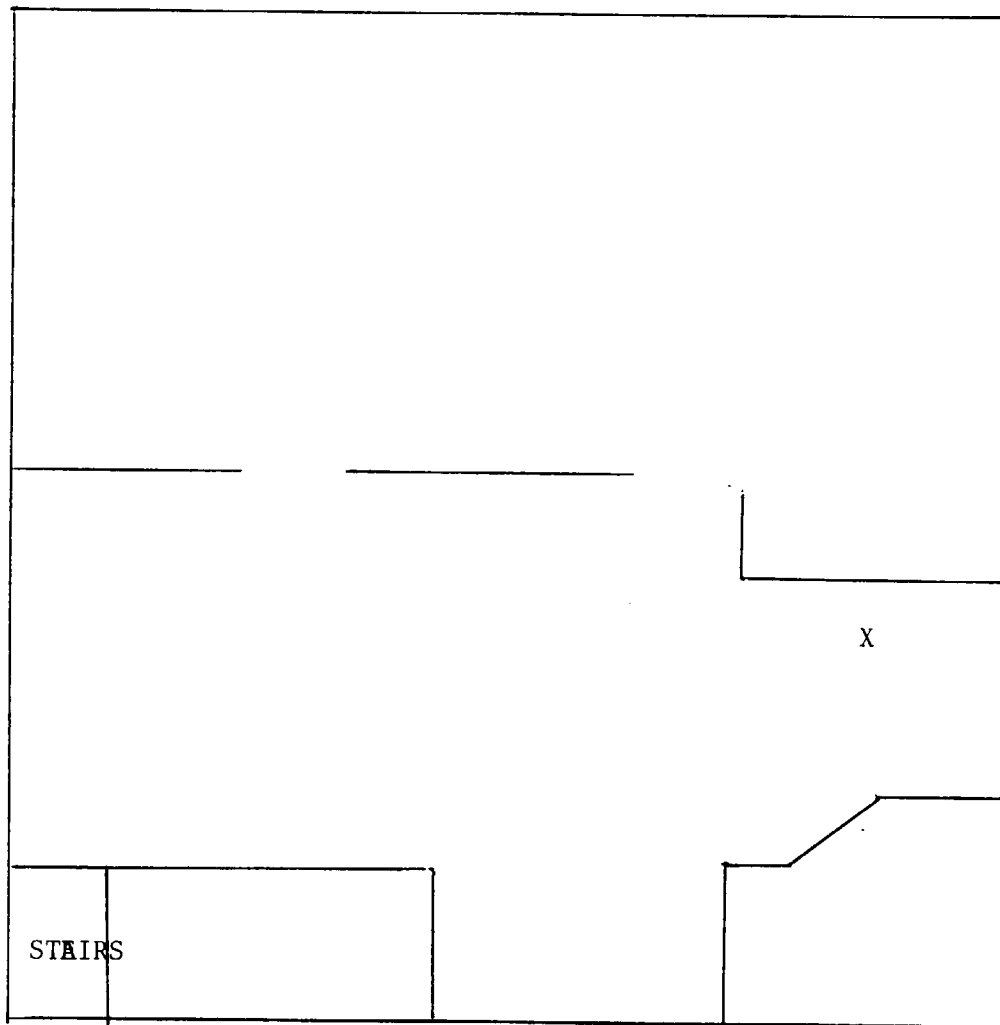
Comments SEE SEPARATE RELEASE SURVEY

Location BUILDING 5 1st FLOOR

Date 6/12/91

Surveyor RICH MILLER

Instruments *LUDLUM 12



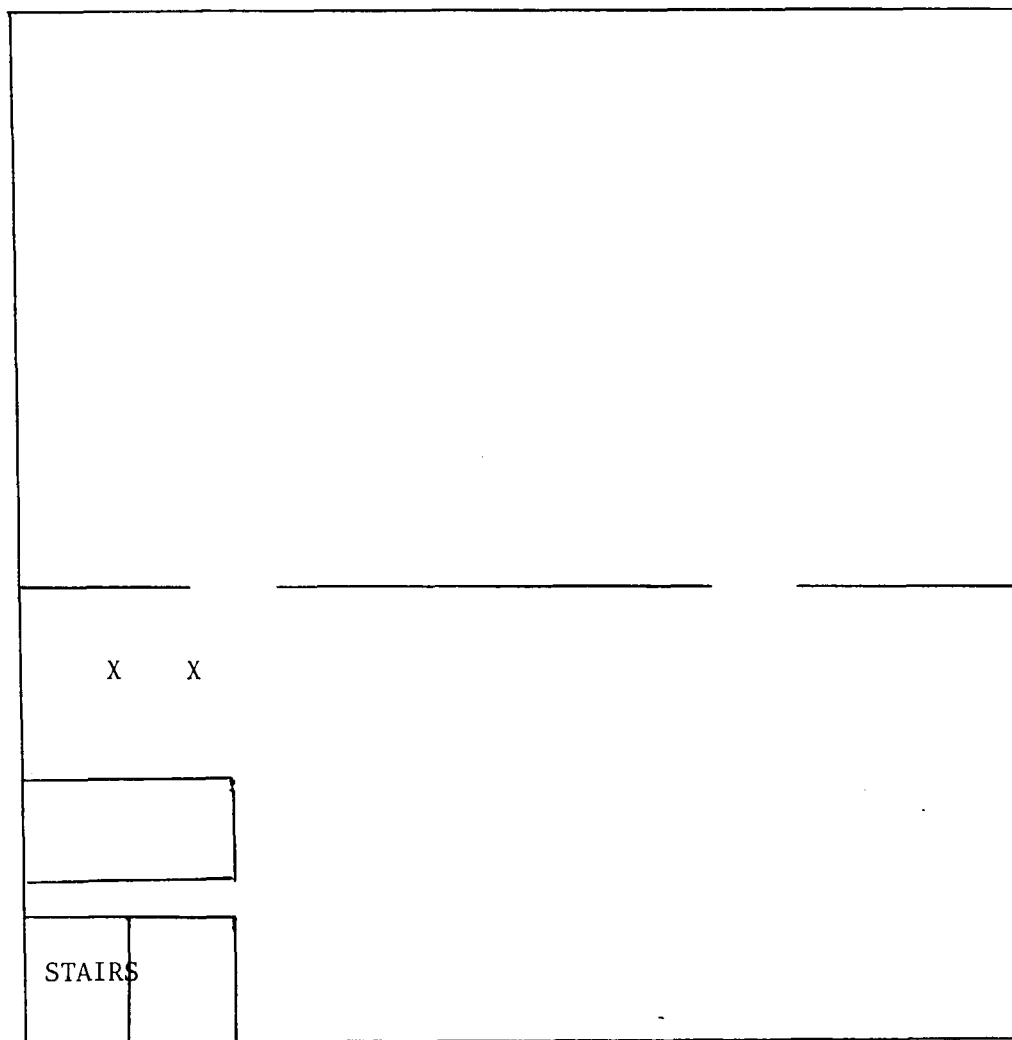
Comments X REPRESENTS ELEVATED READINGS BUT NOT OVER CRITERIA

Location BUILDING 5 2nd FLOOR

Date 6/12/91

Surveyor RICH MILLER

Instruments *LUDLUM 12



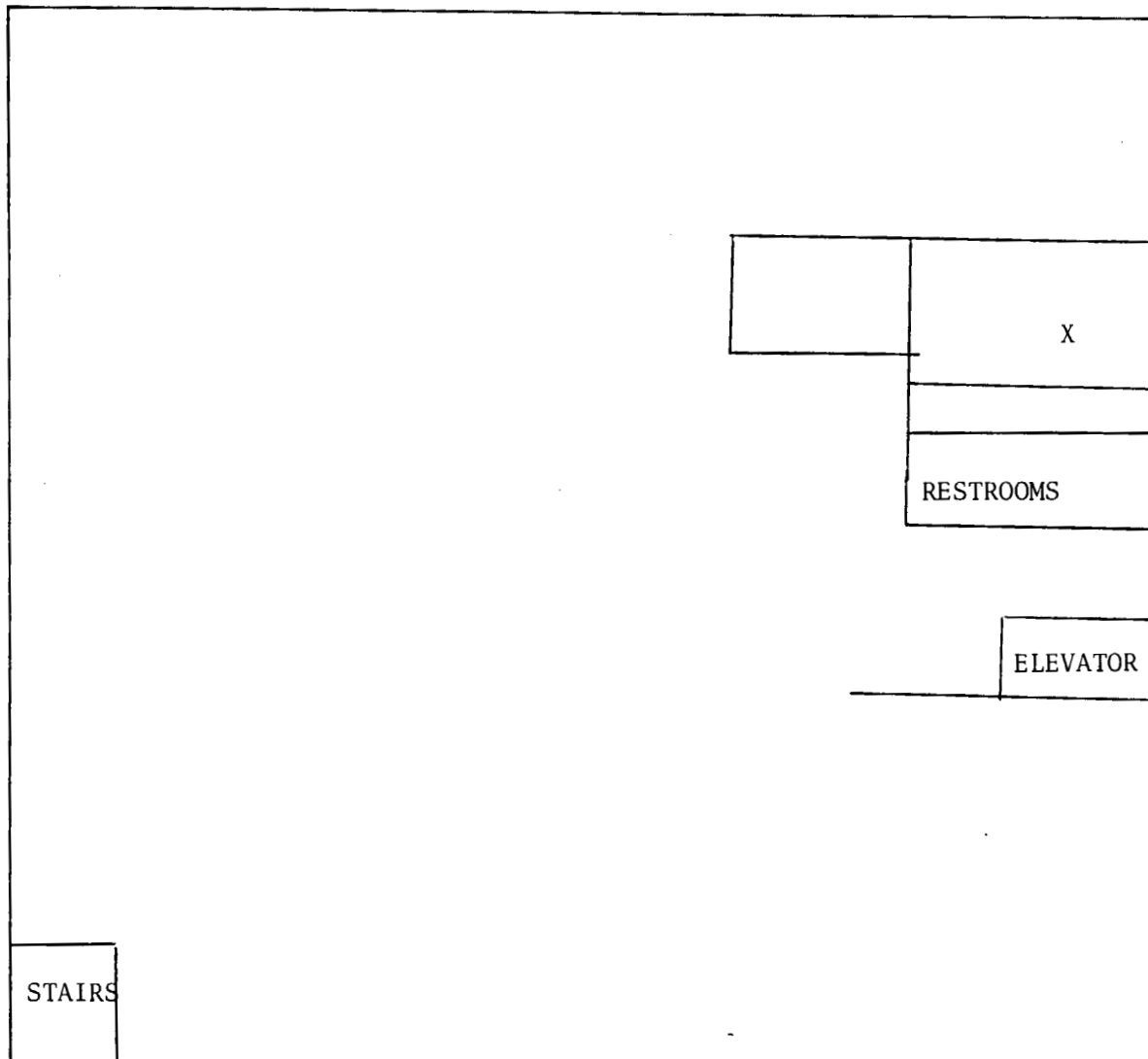
Comments Xs REPRESENT ELEVATED READINGS BUT NOT OVER CRITERIA.

Location BUILDING 5 4th FLOOR

Date 6/12/91

Surveyor RICH MILLER

Instruments LUDLUM 12



Comments X REPRESENTS ELEVATED READINGS BUT NOT OVER CTITERIA.

ATTACHMENT 4: Ground water sampling results

Table 11
Groundwater
Radioactive Analyses Results

Sample ID	Gross Alpha pCi/L	Gross Beta pCi/L	Gamma Spec. pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
B1-D	<2	14±3	*	<0.6	<1
B1-S	3±2**	5±3	*	<0.6	<1
B1-A	<2	5±3	*	<0.6	<1
CC5-D	3±2**	4±3	*	<0.6	<1
CC5-S	<2	8±3	*	<0.6	<1
CC5-A	3±2**	18±6	•	<0.6	<1
CC1	5±3**	10±5	*	<0.6	<1
CC2	4±3**	5±3	*	<0.6	<1
CC3	37±11**	92±14	*	<0.6	<1
CC4	5±3**	7±5	•	<0.6	<1

• No man-made nuclides detected.

** Laboratory indicates high statistical variation due to large amounts of solids.

Table 11
Groundwater
Radioactive Analyses Results
Continued

Sample ID	Thorium 232 pCi/L	Uranium 234 pCi/L	Uranium 235 pCi/L	Uranium 238 pCi/L	Total Uranium pCi/L
B1-D	<0.6	<0.6	<0.6	<0.6	<0.001
B1-S	<0.6	<0.6	<0.6	<0.6	0.003
B1-A	<0.6	<0.6	<0.6	<0.6	0.004
CC5-D	<0.6	<0.6	<0.6	<0.6	0.004
CC5-S	<0.6	<0.6	<0.6	<0.6	<0.001
CC5-A	<0.6	<0.6	<0.6	<0.6	0.011
CC1	<0.6	<0.6	<0.6	<0.6	0.007
CC2	<0.6	<0.6	<0.6	<0.6	0.006
CC3	<0.6	<0.6	<0.6	<0.6	<0.001
CC4	<0.6	<0.6	<0.6	<0.6	<0.001