

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION V

Report No. 81-01
Docket No. 04-01043-10 License No. IV Safeguards Group E(1-A)
Licensee: SRI International
333 Ravenswood Avenue
Menlo Park, California 94025
Facility Name: Hot Cell Facility
Inspection at: Building 131, Camp Parks Military Reservation
Inspection conducted: April 21 & 22, 1981
Inspectors: B. A. Riedlinger 5/12/81
B. A. Riedlinger, Radiation Specialist Date Signed
D. D. Skov 5/13/81
D. D. Skov, Radiation Specialist Date Signed
R. D. Thomas 5/13/81
Approved by: R. D. Thomas, Chief, Materials Radiation Protection Section Date Signed
H. E. Book 5/13/81
Approved By: H. E. Book, Chief, Radiological Safety Branch Date Signed

Summary:

The licensee after the decontamination of their facility requested NRC to conduct a confirmatory survey for a facility release. On April 21-22, 1981 two inspectors, expending a total of 20 inspector hours, conducted this survey.

Results: This survey, conducted with two beta-gamma survey instruments and 90 wipes, found contamination in several areas within Building 131, in one area under a porch, and in one area on the roof of the facility which exceeded NRC guidelines. The NRC survey was terminated until the licensee performs necessary decontamination, conducts the final survey, and submits the survey results for evaluation by the NRC.

RV Form 219 (2)

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DETAILS

1. Persons Contacted

James L. Thomas, Assistant Director, Health and Safety Department,
SRI International

Larry Inman, Chemist, Systems Evaluation Department, SRI

2. Background

On April 6, 1981 the licensee requested NRC:RV to conduct the confirmatory survey towards the final clearance for the Camp Parks Hot Cell Facility (Building 131). With the request, the licensee submitted a report of their decontamination and survey results. Two NRC inspectors were at the Camp Parks Hot Cell Facility on April 21 and 22, 1981 to conduct the confirmatory measurements. The survey criteria were based on the requirements established by "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material, December 1975."

3. Reference Source

An NRC Region V strontium-90 counting source (#7722) was selected as a reference for this confirmatory measurement. The strontium-90 source had 2,520 disintegrations per minute of activity on August 25, 1977. The source had an activity of 2,300 disintegrations per minute in April of 1981.

4. Field Radiation Detection Instruments

The field radiation detection instruments selected to perform this survey were:

- a. Technical Associates Model PUG 1AB with pancake GM and side window GM detector (NRC 004279).
- b. Eberline Model E-520 with pancake GM and side window GM detector (NRC 008253).

The PUG 1AB and the E-520 instruments were used for defining beta-gamma contamination levels. The background of both instruments with their pancake GM detectors was 100 counts per minute (cpm). Both instruments indicated a net count of 450 cpm with pancake probes at the surface of the counting source #7722, described above. Therefore, the instruments had 20 percent efficiencies when used with the pancake probes.

5. Acceptable Release Levels

The major isotopes used under this license were: strontium-90, cesium-137, cesium-134, ruthenium-106, cerium-144, and other short-lived beta-gamma emitting radioisotopes. Some depleted uranium was also possessed. Licensee representatives stated that the depleted uranium was in the form of metal rods. Since the ninety-one wipes taken to

check for removable contamination indicated no alpha contamination, an alpha survey of the facility was not conducted. The acceptable release levels for strontium-90 are more restrictive than those for other beta-gamma emitters used under this license. Therefore, it was assumed that any contamination found was due to strontium-90.

The acceptable radiation and contamination levels established by the guideline for strontium-90 in the absence of more hazardous radionuclides are summarized in Table I.

TABLE I
ACCEPTABLE LEVELS

	<u>Maximum</u>	<u>Average</u>	<u>Removable</u>
Radiation	1.0 mRad/hr at 1 cm	0.2 mRad/hr at 1 cm	N/A
Contamination	3,000 dpm per 100 square centimeters	1,000 dpm per 100 square centimeters	200 dpm per 100 square centimeters

6. Meter Allowable Readings

Meter allowable readings (MAR), excluding natural background radiation, were developed relative to the guideline and the response of the instrument to the NRC strontium-90 reference source. The MAR determinations are detailed in Attachment 1.

To determine the MAR for the direct surface contamination survey, the area of the radioactive contamination needs to be defined. Wide areas of contamination, distributed over several square centimeters of area, will cause an instrument response lower than if the same amount of contamination was measured, all at one time, under the sensitive area of the detector. Therefore, the contamination MAR were further qualified to the acceptable limits for the distribution of the radioactive contamination on a wide area or localized spot. For this confirmatory survey wide area contamination is the condition in which the radioactive contamination is distributed over an area of 100 square centimeters or more, and the spot contamination is the condition in which the contamination is distributed over less than 100 square centimeters. During the survey, spot contamination was indicated where a positive instrument reading was greatly reduced, especially back to normal background, when the detector was moved laterally the distance one detector diameter from the surface of the contamination. Table II is a summary of the contamination limits established for the use of PUGIAB or the Eberline E-520 with the GM pancake detectors.

TABLE II
CONTAMINATION LIMITS

<u>Area of Contamination</u>	<u>Maximum MAR</u>	<u>Average MAR</u>
Spot (< 100 cm ²)	600 cpm	200 cpm
Wide (≥ 100 cm ²)	90 cpm	30 cpm

7. Wipes Survey

Whatman #42 filter paper or Nucon cloth smears, depending on the roughness of the sampled surfaces, were used exclusively during this survey. The type of wiping material was not expected to change the efficiency of the wiping procedure counting technique. The wiping procedure was to apply medium pressure over the area being wiped, and sample at least a 100 square centimeter area.

These wipes were counted with the Region V NMC PC-55 gas flow proportional counter, NRC #000383. Using the NRC strontium-90 standard, a counter efficiency of 71 percent was observed. The background was 56 cpm on April 22, 1981, when the first group of wipes were counted. The background was 55 cpm on April 24, 1981 when the rest of the wipes were counted.

8. Inspection Details

a. Building Interior Survey

The Hot Cell Facility, Building 131, Camp Parks floor plan is given in Figure 1. Several walls were removed by the licensee during the decontamination effort. The condition of the building as found at the time of the inspection is given in Figure 2.

The entire inside floor area (with the exception of the porch floor) had been resurfaced with asphalt. The licensee had carried out decontamination efforts and documented a floor survey prior to the resurfacing. Licensee representatives stated that these survey results have been maintained.

Locations of wipes and direct readings taken on April 21, 1981 are shown on Figure 3. Locations of wipes and direct readings taken on April 22, 1981 are shown on Figure 4. Results are tabulated in Attachment 2.

(1) Lab

The lab was an empty room with a cart of equipment inside. Licensee representatives stated that the equipment was awaiting transfer to another controlled area. Therefore, the cart and equipment was not surveyed. There was a plugged floor drain in one corner of the room (location c on Figure 4).

The lab was surveyed with GM pancake probes. The drain plug area indicated 150 counts per minute fixed contamination. No other readings above background were observed. Eight sampling wipes were taken. The location of the areas sampled are indicated in Figure 4. The counting results, as determined by the Region V laboratory scaler, are given in Attachment 2. One wipe indicated 6 dpm per 100 square centimeters. The others indicated only background levels of radioactivity.

Based upon the direct survey and wipe samples, it appears that the lab meets the requirements of the established NRC guidelines.

(2) Lab Storage

The lab storage room was still in use by the licensee. Counting equipment and desk areas were located in this room, as well as more equipment awaiting transfer to another controlled area. There were boards over the asphalt in some areas of the room.

The lab storage room was surveyed with GM pancake probes. No readings above background were observed. Eight sampling wipes were taken. The location of the areas sampled are indicated in Figure 4. The counting results, as determined by the Region V laboratory scaler, are given in Attachment 2. It was determined that the wipes counted indicated only background levels of activity.

Based upon the direct survey and wipe samples, it appears that the lab storage room meets the requirements of the established NRC guidelines.

(3) Counting Room

The Counting Room was an empty room.

The room was surveyed with GM pancake probes. No readings above background were observed. Nine sampling wipes were taken. The location of the areas sampled are indicated in Figure 4. The counting results, as determined by the Region V laboratory scaler, are given in Attachment 2. It was determined that the wipes counted indicated only background levels of activity.

Based upon the direct survey and wipe samples, it appears that the Counting Room meets the requirements of the established NRC guidelines.

(4) Restroom

The restroom was still used.

The room was surveyed with a GM pancake probe. Two spots indicated on Figure 3 showed readings above background level (W:300 cpm, and X:200 cpm). Results are given in Attachment 2. No wipes were taken in the restroom. The licensee was asked to resurvey the room.

(5) Former Waste and Isotope Storage Areas

The Waste and Isotope Storage Areas were a large open space extending from the outside wall of the lab and counting rooms to the southern most side-opening doorways of the facility.

The walls and floors in the former waste and isotope storage areas were spot-checked with GM pancake probes. Then, direct readings with a pancake probe and wipe checks were made at the 48 locations noted on Figure 4 (wipe W6 was accidentally missed during the survey). Three other wipes were taken in this area on April 21, 1981. Their locations are noted on Figure 4. Results of the wipe counting and direct readings are displayed in Attachment 2. There were two direct readings above background. At location W7 there was 50 cpm fixed contamination, and at location W12 there was 150 cpm contamination (18 dpm removable). These meet the limits for spot contamination shown in Table II. There were six wipes which indicated removable contamination above background levels. The maximum indication was 86 dpm per 100 square centimeters. This meets the release criterion of 200 dpm per 100 square centimeters as shown on Table I.

Based upon the direct survey and wipe samples, it appears that the former waste and isotope storage areas meet the requirements of the established NRC guidelines.

(6) Former Hot Cell Area

The Hot Cell Area was a large empty space extending from the southern most side doors of the facility to the south wall, which has a doorway that opens onto a porch. Rain had leaked into this area through a hole in the roof.

The walls were thoroughly surveyed with GM pancake probes, and nine wipes were taken in this area. The locations of the wipes and of several direct readings are shown in Figure 3. Results are tabulated in Attachment 2. The maximum direct radiation reading was 25,900 cpm. The maximum removable contamination was 7,718 dpm per 100 square centimeters. Several locations were noted where the release limits in Tables I and II were exceeded.

Based upon the direct survey and wipe samples, it appears that the former hot cell area does not meet the requirements of the established NRC guidelines.

(7) Porch

The porch area opened to the outdoors on the south, although there were three wall sections on the south side. The west and east sides of the porch were walled in. The floor was

wooden boards. There were spaces between the boards. Licensee representatives stated that a solid floor had been placed over the present floor during facility operation. That flooring had been removed. There is a crawl space below the porch, and there is a 1' x 1' x 2' hole under the porch where rain water has collected. Licensee representatives stated that they did not know why the hole was there, but rain water had to be removed from it with a sump pump during facility operations.

The porch was surveyed with GM pancake probes, and five wipes were taken. The locations of the wipes and of several direct readings are shown in Figure 3. Results are tabulated in Attachment 2. The maximum direct radiation reading was 19,900 cpm. The maximum removable contamination was 23 dpm per 100 square centimeters. Several locations were noted where the release limits in Table II were exceeded.

Based upon the direct survey and wipe samples, it appears that the porch area does not meet the requirements of the established NRC guidelines.

b. Building Exterior Survey

As part of the survey at Building 131, Camp Parks, the roof of the facility, a concrete pad at the south end of the facility, and areas under the porch were surveyed. Three areas where direct readings were recorded are indicated on Figure 3. Results are indicated on Attachment 2. No wipes were taken in these areas.

Results of the roof survey indicated that one area of approximately one square meter yielded direct radiation readings of 1,000 cpm.

It should also be noted that a survey in the crawl space under the northwest corner of the porch indicated direct readings 150 cpm above normal background.

Based upon the direct survey readings of the roof and crawl space areas, it appears that the requirements of the established NRC guidelines (as indicated in Table II) have not been met.

c. Environmental Sample

A water sample was collected from the hole underneath the porch of the facility (see Report item 1.G.). The sample was collected on April 22, 1981 and was sent to the Idaho Operations Office for analysis. Results will be added to this report as Attachment 3 as soon as they are received.

d. Conclusion and Exit Meeting

An exit meeting with the licensee was conducted on April 22, 1981.

The licensee was informed that the former Hot Cell Area, the porch, an area of the roof, and an area under the porch, did not appear to meet the limitations of the established NRC guidelines. The licensee should conduct a survey of the concerned areas, perform necessary decontamination, conduct a final survey and submit a written report of the decontamination and final survey to the NRC for evaluation. The licensee was also asked to include the restroom in the resurvey and decontamination effort. The licensee representatives were informed that the NRC Region V confirmatory survey would not be continued until their written report had been received.

The licensee representatives stated that the decontamination effort will continue and that the required survey report will be submitted.

ATTACHMENT 1

I. Meter Allowable Readings (MAR) Contamination Calculations

In order to equate the acceptable contamination limits established in Table I of this report, to the MAR values for fixed contamination, it was necessary to establish calculated values for spot and wide surface area contamination levels. For the purpose of calculating instrument response for spot contamination areas, it was assumed that all radioactivity is contained within a 15 cm² surface area, which is the sensitive area of the pancake GM detector. For the wide surface area contamination, it was assumed that the radioactive material was distributed over an area in excess of 15 cm².

The pancake GM detector had an established efficiency of 20%.

To be equivalent to the acceptable limits specified in Table I, the MAR values have been calculated and extrapolated to a 100 cm² area.

a. Spot Contamination:

$$\text{MAR (maximum)} = (3,000 \text{ dpm}) (.20) = 600 \text{ cpm}$$

Therefore, a MAR of 600 cpm is equivalent to 3,000 dpm per 100 square centimeters.

$$\text{MAR (average)} = (1,000 \text{ dpm}) (.20) = 200 \text{ cpm}$$

Therefore, a MAR of 200 cpm is equivalent to 1,000 dpm per 100 square centimeters.

b. Wide Area Contamination:

$$\begin{aligned} \text{MAR (maximum)} &= 600 \text{ cpm} \left(\frac{15 \text{ cm}^2}{100 \text{ cm}^2} \right) \\ &= 90 \text{ cpm} \end{aligned}$$

Therefore, a MAR of 90 cpm is equivalent to 3,000 dpm per 100 square centimeters.

$$\begin{aligned} \text{MAR (average)} &= 200 \text{ cpm} \left(\frac{15 \text{ cm}^2}{100 \text{ cm}^2} \right) \\ &= 30 \text{ cpm} \end{aligned}$$

Therefore, a MAR of 30 cpm is equivalent to 1,000 dpm per 100 square centimeters.

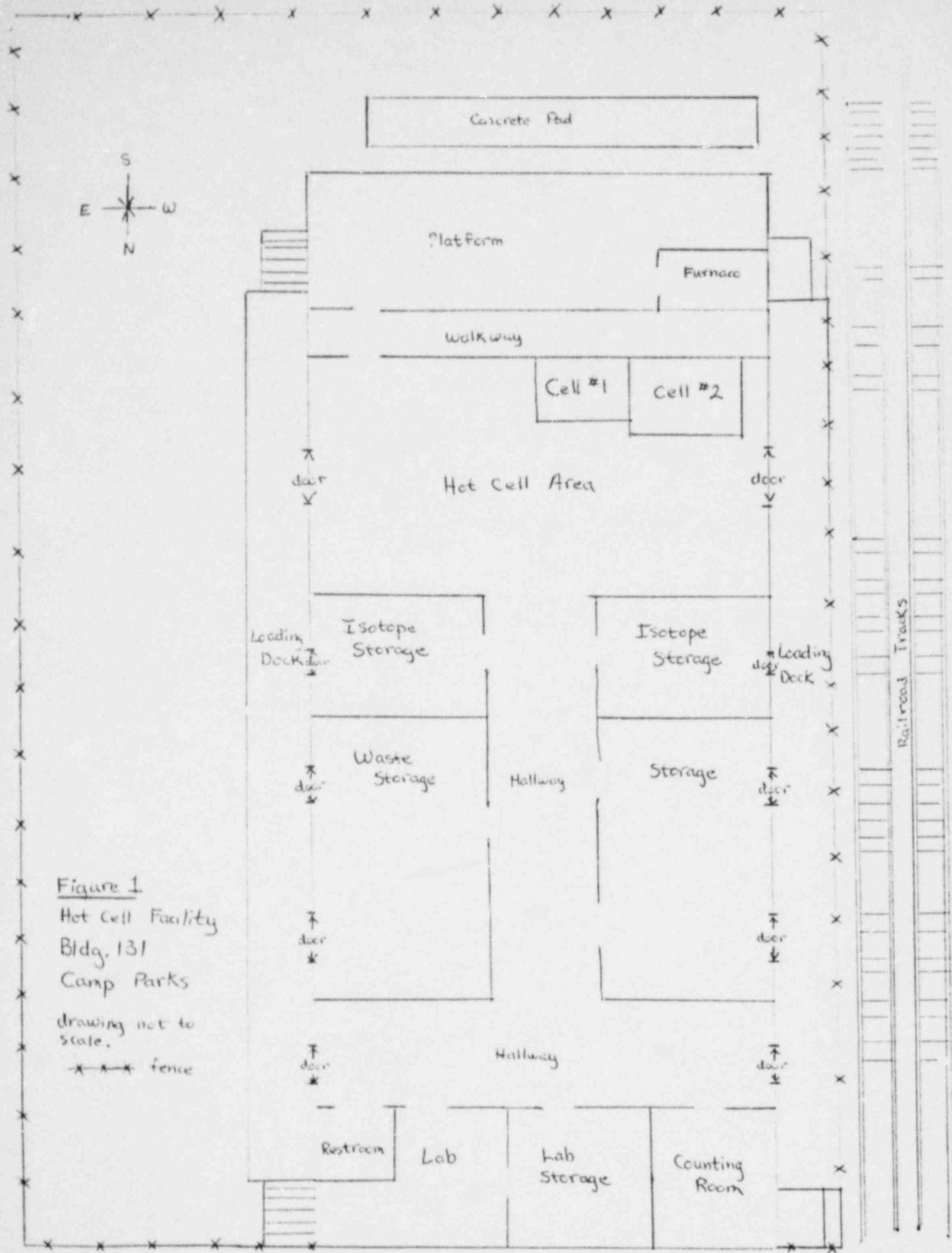


Figure 1
 Hot Cell Facility
 Bldg. 131
 Camp Parks
 drawing not to
 scale.
 x x x fence

POOR ORIGINAL

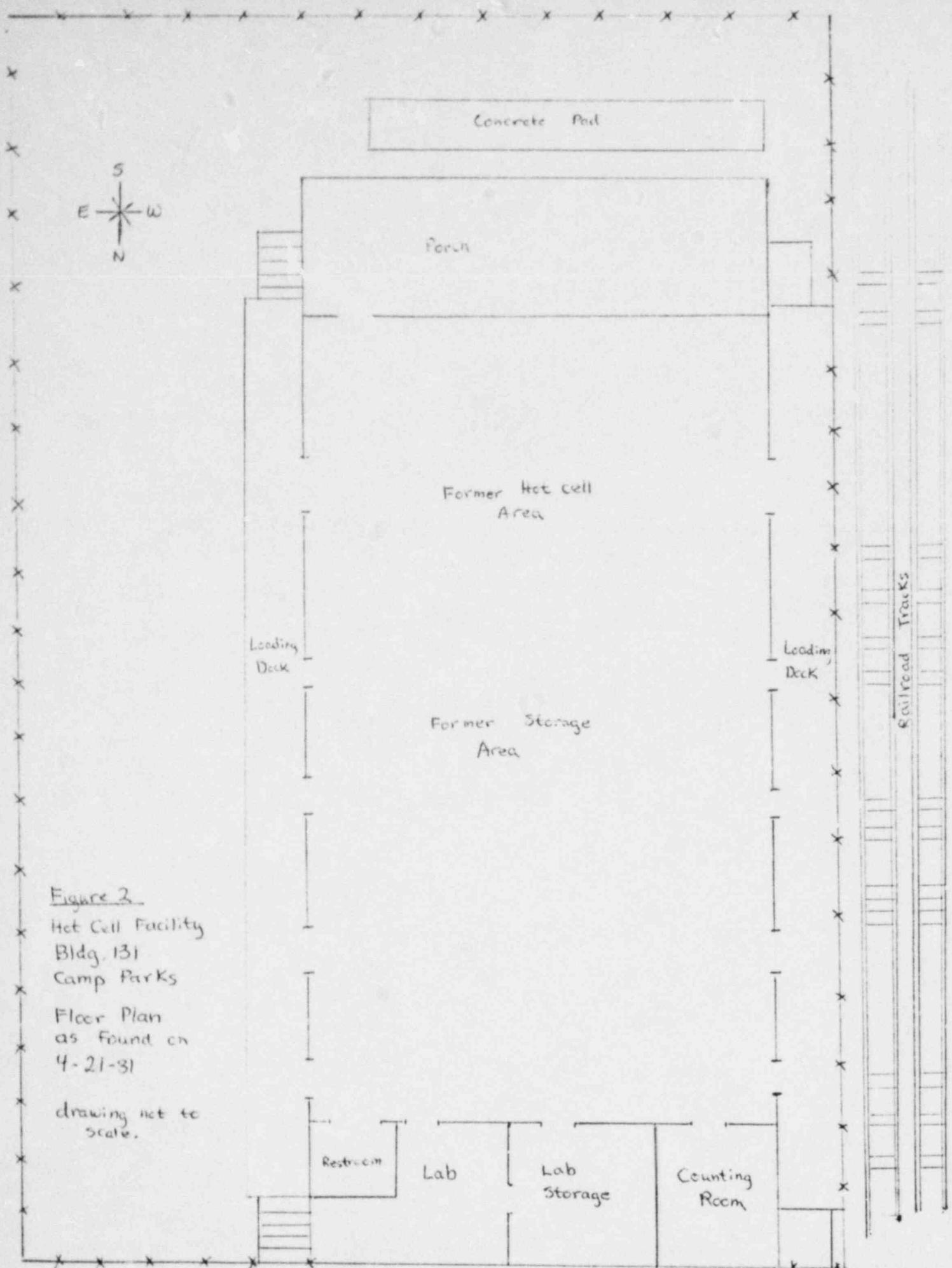


Figure 2.
 Hot Cell Facility
 Bldg. 131
 Camp Parks
 Floor Plan
 as found on
 4-21-31
 drawing not to
 scale.

POOR ORIGINAL

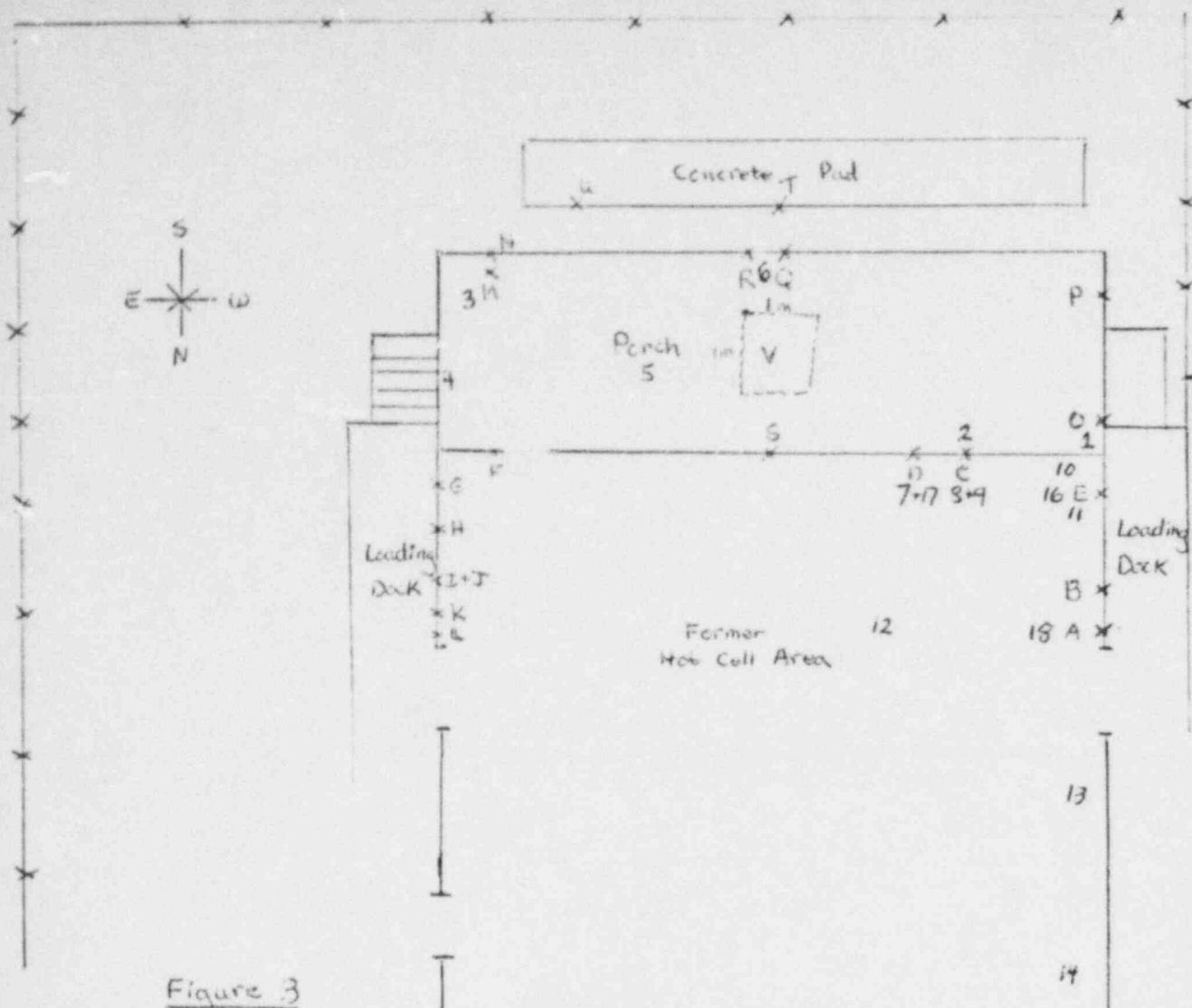
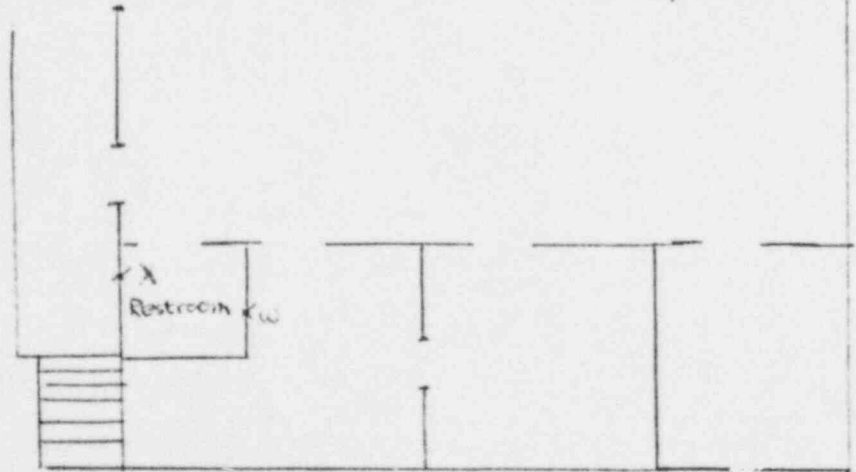


Figure 3
 Locations of wipes
 and direct readings
 taken on 4-21-31/15

Note: Direct readings are indicated with capital letters
 Wipe locations are indicated with Roman numerals
 See Attachment 2 for tabulation of results
 ---- outlines Area V on the roof over the porch



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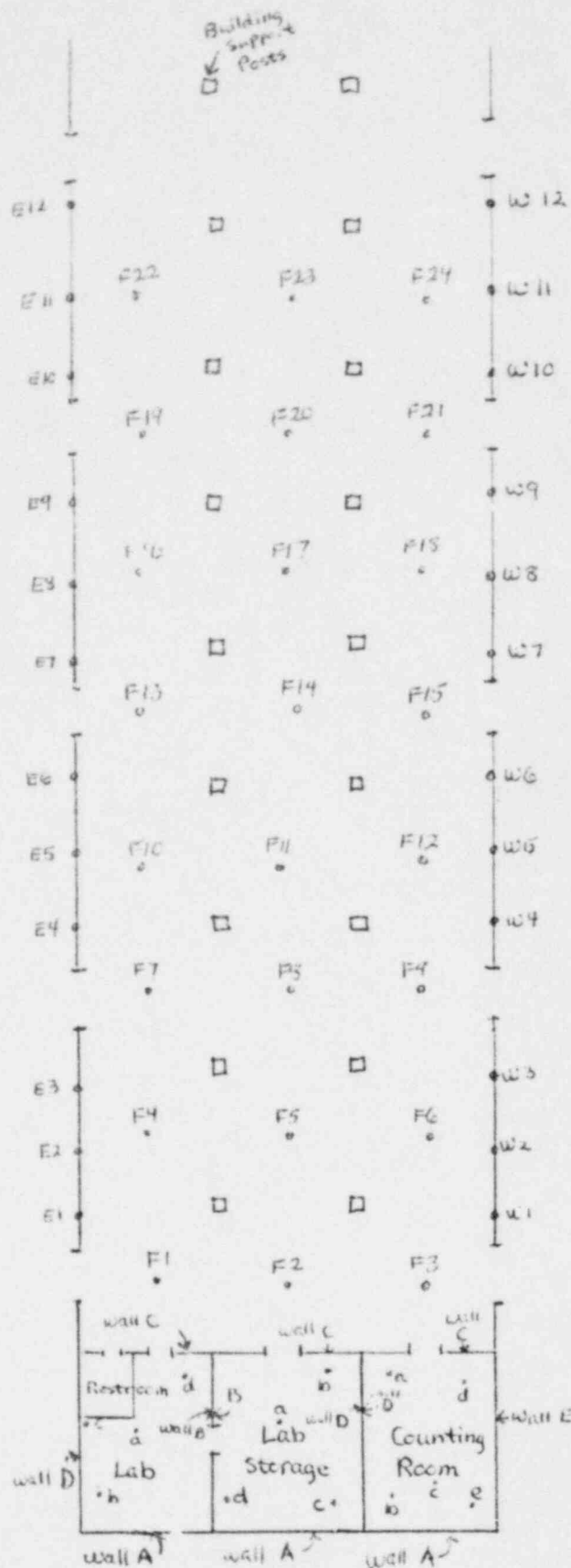
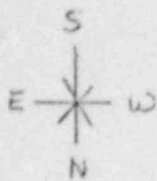


Figure 4
 Locations of Wipes
 and direct readings
 taken on 4-22-81
 Hot Cell Facility
 Bldg. 131
 Camp Parks

Scale: 10mm \cong 10ft

See Attachment 2 for
 tabulation of results

POOR ORIGINAL

ATTACHMENT 2

I. Tabulation of results of direct readings with survey instruments and of wipe tests made on April 21, 1981.

Wipes were counted on the Region V gas flow proportional counter on April 22, 1981. Locations of readings and wipes are shown on Figure 3.

Note: The releaseable limit for removable contamination is 200 dpm per 100 square centimeters, as shown on Table I. MAR for fixed contamination are shown in Table II.

a. Wipes taken on April 21, 1981

<u>Wipe</u>	<u>Location</u>	Results in dpm per 100 square centimeters	
		<u>Alpha</u>	<u>Beta-gamma</u>
1.	Porch corner	0	1
2.	Porch floor under vent outlet	0	0
3.	Porch corner	0	6
4.	Outside surface of east wall of porch	0	4
5.	Pole on porch	0	0
6.	Porch floor	0	23
7.	Wall inside former walkway	0	76
8.	Ledge under window in former walkway	0	54
9.	Upper corner where vent was located in the former walkway	0	0
10.	Floor in corner near former location of hot cells	0	0
11.	Wall near former location of hot cells	0	0
12.	Area on floor where rain had leaked through the roof	0	0

<u>Wipe</u>	<u>Location</u>	Results in dpm per 100 square centimeters	
		<u>Alpha</u>	<u>Beta-gamma</u>
13.	Ledge on wall	0	0
14.	Wall ledge-floor level	0	0
15.	Top of circuit breaker box	0	0
16.	Wall near former location of hot cell	0	7,718
17.	Wall - 7' high on wall, about 14' from west wall	0	2,465
18.	In corner on floor level near doorway	0	183

b. Direct surveys made with GM pancake probes on April 21, 1981

<u>Location Noted on Figure 3</u>	<u>Further Description of Location</u>	<u>Meter reading with Background Subtracted</u>
A	On floor level in corner near door	2,300 cpm
B	On wall, 7' high 6' from door near former hot cells	9,900 cpm
C	On plywood (which was later removed to allow a more complete survey) 9' from corner, 7' above floor	1,900 cpm
D	On wall, 7' high and 14' from west wall	2,000 cpm
E	On wall. 4.5' off floor 1.5' from back wall	25,900 cpm
F	On wood near floor level and near porch door	1,900 cpm

<u>Location Noted on Figure 3</u>	<u>Further Description of Location</u>	<u>Meter reading with Background Subtracted</u>
G	On wall 1' above floor 1' from south wall	6,900 cpm
H	On wall 5' from south wall 3' above floor	1,400 cpm
I	On wall, 11' from south wall about floor level	500 cpm
J	On wall, 4.5' above floor and 11' from south wall	400 cpm
K	On wall, 6' above floor and 16.5' from south wall	200 cpm
L	On wall, 20.5' from south wall at floor level	200 cpm
M	On porch floor 3' from east wall. 1' from dock edge	19,900 cpm
N	On baseboard 2.5' from east wall at floor level	200 cpm
O	On west wall, 4' above floor. 23' from south dock edge	4,900 cpm
P	On west wall, 5' above floor. 2' from south dock edge	1,000 cpm
Q	On south wall of porch. 5' above floor 30' from west wall	1,400 cpm
R	On south wall of porch. 1.5' above floor, 30' from west wall	400 cpm
S	On north wall of porch over main switch panel	150 cpm
T	On concrete pad off porch 16' from west end of pad. On north side	300 cpm
U	On north side of concrete pad. 3' from west end	200 cpm

<u>Location Noted on Figure 3</u>	<u>Further Description of Location</u>	<u>Meter reading with Background Subtracted</u>
V	On roof over porch 6'-8' from south end of room. About 30' from west wall	1,100 cpm (maximum) 1,000 cpm over an area of about 1 square meter
W	On west wall of restroom. 2' above floor 3' from door	300 cpm
X	On window ledge in restroom	200 cpm

II. Tabulation of results of direct readings with survey instruments and of wipes made on April 22, 1981.

Wipes were counted on the Region V gas flow proportional counter on April 24, 1981. Locations of readings and wipes are shown on Figure 4.

Note: The releaseable limit for removable contamination is 200 dpm per 100 square centimeters, as shown on Table I. MAR for fixed contamination are shown in Table II.

<u>Location as Noted on Figure 4</u>	<u>Further Description of Location</u>	<u>Direct Meter Reading with Background Subtracted</u>	<u>Results of wipe tests in dpm per 100 square centimeters</u>	
			<u>Alpha</u>	<u>Beta-gamma</u>
Lab a	floor	0	0	0
Lab b	floor	0	0	0
Lab c	floor over drain plug	150 cpm	0	0
Lab d	floor	0	0	0
Lab A	wall	0	0	6
Lab B	wall	0	0	0
Lab C	wall	0	0	0
Lab D	wall	0	0	0
Lab Storage a	floor	0	0	0
Lab Storage b	floor	0	0	0

Location as Noted on Figure 4	Further Description of Location	Direct Meter Reading with Background Subtracted	Results of wipe tests in dpm per 100 square centimeters	
			Alpha	Beta-gamma
Lab Storage c	floor	0	0	0
Lab Storage d	floor	0	0	0
Lab Storage A	wall	0	0	0
Lab Storage B	wall	0	0	0
Lab Storage C	wall	0	0	0
Lab Storage D	wall	0	0	0
Counting Room a	floor	0	0	0
Counting Room b	floor	0	0	0
Counting Room c	floor	0	0	0
Counting Room d	floor	0	0	0
Counting Room e	floor	0	0	0
Counting Room A	wall	0	0	0
Counting Room D	wall	0	0	1
Counting Room C	wall	0	0	0
Counting Room E	wall	0	0	0
E1	wall (W)	0	0	0
E2	wall ledge at floor level (FL)	0	0	86
E3	W	0	0	0

<u>Location as Noted on Figure 4</u>	<u>Further Description of Location</u>	<u>Direct Meter Reading with Background Subtracted</u>	<u>Results of wipe tests in dpm per 100 square centimeters</u>	
			<u>Alpha</u>	<u>Beta-gamma</u>
E4	FL	0	0	0
E5	W	0	0	0
E6	FL	0	0	17
E7	W	0	0	0
E8	FL	0	0	14
E9	W	0	0	0
E10	FL	0	0	0
E11	W	0	0	0
E12	FL	0	0	0
W1	W	0	0	0
W2	FL	0	0	0
W3	W	0	0	1
W4	FL	0	0	0
W5	W	0	0	0
W6	FL	0	- wipe accidentally - missed	
W7	W	50 cpm	0	0
W8	FL	0	0	13
W9	W	0	0	7
W10	FL	0	0	0
W11	W	0	0	0
W12	FL	150 cpm	0	18

- Note:
- 1) All wipes with prefix "F" (see Figure 4) were taken from the floor of the facility.
 - 2) Direct survey readings with a pancake probe showed no reading in excess of normal background on the floor of the facility at "F" series wipe locations.
 - 3) Wipe test results for all wipes with prefix "F" showed no removable contamination.