



THE CATHOLIC UNIVERSITY OF AMERICA

*Radiation Safety Office  
Washington, D.C. 20064  
202-319-5206*

**REACTOR DECOMMISSIONING REPORT  
&  
FINAL STATUS SURVEYS**

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PDR ADOCK 05000077  
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## 1.0 BACKGROUND INFORMATION

### 1.1 Facility History

The Aerojet General Nucleonics (AGN) Model AGN-201 reactor, Serial Number 101, came to The Catholic University of America (CUA) in October, 1957, under an educational grant from the Atomic Energy Commission following its around-the-world trip as a demonstration reactor under President Eisenhower's "Atoms for Peace Plan." It was primarily used as a training reactor for degree candidates within the University's Nuclear Science and Engineering Department. The original start up operation team for Baltimore Gas and Electric's Calvert Cliffs nuclear power plant was also trained on this reactor.

The application to acquire and possess an AGN-201 nuclear reactor was filed by CUA on July 10, 1957 and amended on August 23 and November 13, 1957. Pursuant to License No. R-31, issued November 15, 1957, an AGN-201 reactor, Serial No. 101, was acquired from the Aerojet-General Nucleonics Corporation. The original license was for a period of twenty years and specified a maximum thermal power of 0.1 watts. Initial criticality was achieved on November 20, 1957.

The license was renewed on March 14, 1979 which extended the operating authority to 1997. However, in March 1986 reactor status was changed to possession only. The reactor has been shut down since 1982.

### 1.2 Facility Closure

The reactor was defueled on March 17, 1990 under a NRC approved defueling plan. The fuel was secured in safe storage on site.

By applications dated February 6, 1992, CUA requested authorization to decommission and dismantle the reactor and to dispose of the component parts, in accordance with the Decommissioning Plan for the AGN-201 Research Reactor submitted as part of the application.

On September 24, 1992 the Commission issued the order that approved the Decommissioning Plan and authorized decommissioning of the reactor in accordance with the application and Decommissioning Plan.

### 1.3 CUA Schedules and Objectives

CUA has worked to an end of the year deadline for the completion of the decommissioning work necessary to meet the objectives outlined below. This revised deadline has been influenced by several factors, the most significant of which was the extensive planning and preparations required before receiving

### 1.3 CUA Schedules and Objectives (con't)

authorization to ship the reactor fuel to an off site government facility. This shipment was completed on 9-12-94

In addition to the scheduler goals, CUA's Decommissioning Plan objectives are:

1. To decontaminate and decommission the reactor room facility in order to permit release for "unrestricted" use.
2. To accomplish the work in a safe and environmentally acceptable manner in accordance with all applicable federal and District laws and regulations
3. To minimize the volume of waste requiring burial.
4. To maintain exposures As Low As Reasonably Achievable (ALARA) and,
5. To meet the above objectives while performing the work in the most cost effective manner practicable.

## 2.0 SITE DESCRIPTION

### 2.1 Site Location

The 154 acre CUA main campus is located in the NE quadrant of the District of Columbia, bounded by Michigan Avenue, Harewood Road, Taylor Street, and John McCormick Avenue. Figure 1 locates this quadrant.

CUA was founded more than a century ago as a graduate institution and research center in the European tradition. The university enrolls approximately 3600 graduate students and 3000 undergraduates representing most of the states and more than 100 foreign countries. (Figure 2 shows a general layout of the main campus.)

The reactor has been permanently located in the Pangborn Building (Engineering and Architecture) in the north wing of the basement level since 1967. Figure 3 highlights the location of Pangborn Hall, on an older map for ease of reading.

### 2.2 Facility Description

The licensed nuclear reactor facility area consists of one room in Pangborn Hall identified as Room B-16R. The AGN-201 reactor was designed to be a totally self-contained system. There was no auxiliary equipment associated with the reactor, nor was any ventilation system required. The reactor facility consists of a steel tank, approximately 7 feet in diameter by 13 feet high, which houses the reactor and its integral shielding. This facility was in a pit, 13 ft. by 13 ft. by 6.5 ft. deep, in the north end of the room. There is no

## 2.2 Facility Description (con't)

floor drain in the reactor pit. This type of reactor was designed as a sealed system and, when operated, did not generate any gaseous or liquid radioactive effluent. Figure 4 shows B-16R and the surrounding areas.

Access to the reactor core could only be obtained from the top access plate to the thermal column and then only with the use of considerable heavy equipment and riggers to lift out the thermal column vessel and a second steel vessel containing the reactor core and its lead and graphite shielding. Access to the reactor core was never authorized in the operational tech specs.

The reactor has been stripped of all component parts such that only the steel tank remains in the pit. The reactor operating console has been disconnected and removed from the room. A catwalk around the tank perimeter and a safety railing around the pit remain in place.

## 3.0 OPERATING HISTORY

### 3.1 General Information

A review of the reactor operating logs, covering all operations at CUA (1957-1982) shows that the reactor was critical for approximately 610 hours, during which time approximately 971.9 watt-min (16.2 watt-hr) of thermal energy was generated.

The reactor was licensed at CUA for a thermal power level not to exceed 100 milliwatts. It has been operated intermittently at all licensed power levels. The average power level over all operating time at CUA (16.2 watts-hrs ÷ 610 hrs) is approximately 27 milliwatts (thermal). The reactor was last operated on December 4, 1982, for a total of 71 minutes.

### 3.2 Operations Performed

The reactor was operated first by the Department of Nuclear Science and Engineering, and subsequently by the Department of Mechanical Engineering, for training nuclear engineering graduate students. The reactor usually was operated in conjunction with a Nuclear Reactor Laboratory course and used primarily for performing basic reactor physics experiments requiring a low flux level.

The inherent design features on this reactor, the low power level at which it was operated and the low accumulated running time precluded any significant buildup of fission products. No unusual problems have been identified during over 20 years of authorized operation.

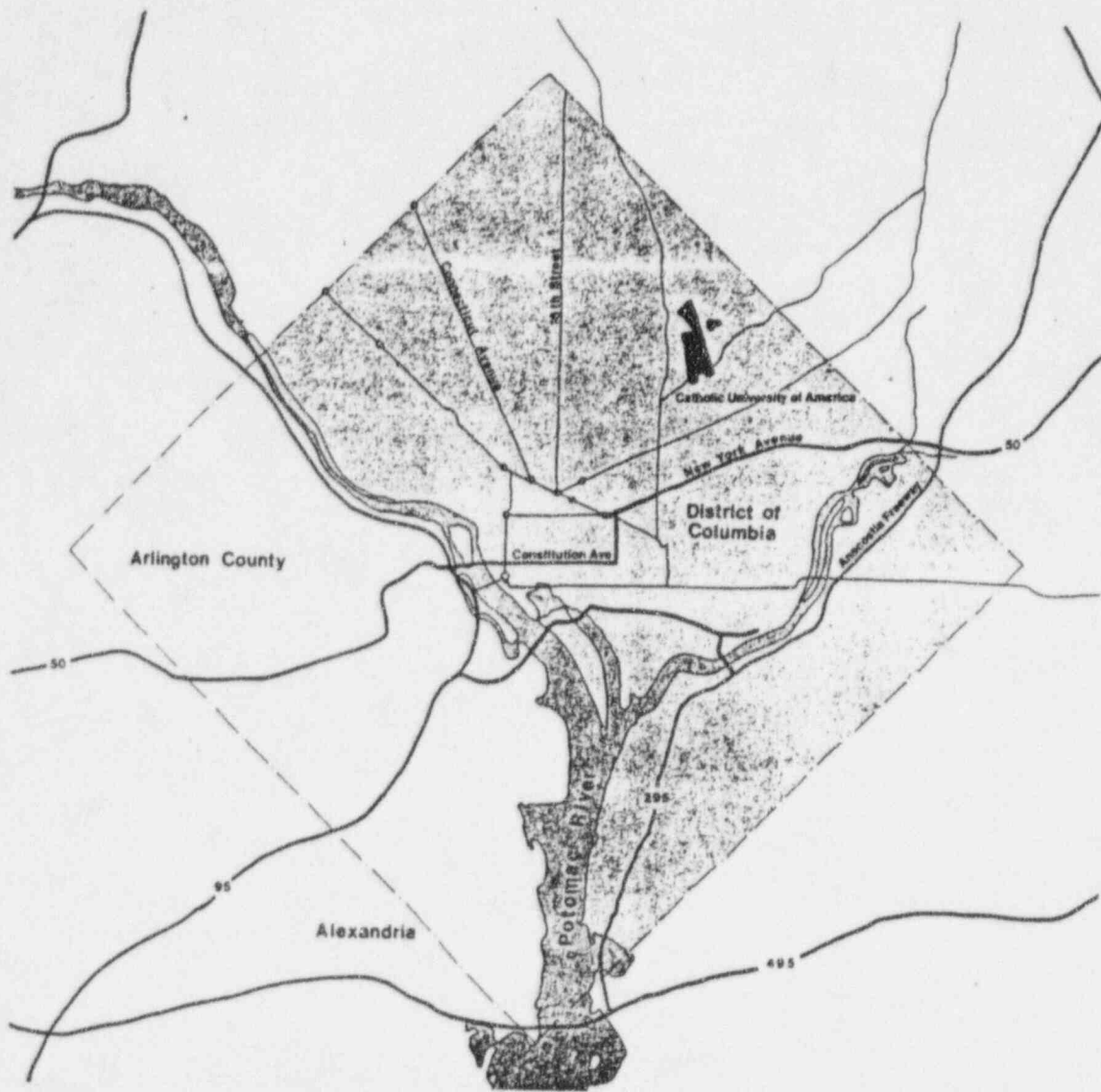


Fig. 1 Location of the Catholic University of America



# THE CATHOLIC UNIVERSITY OF AMERICA



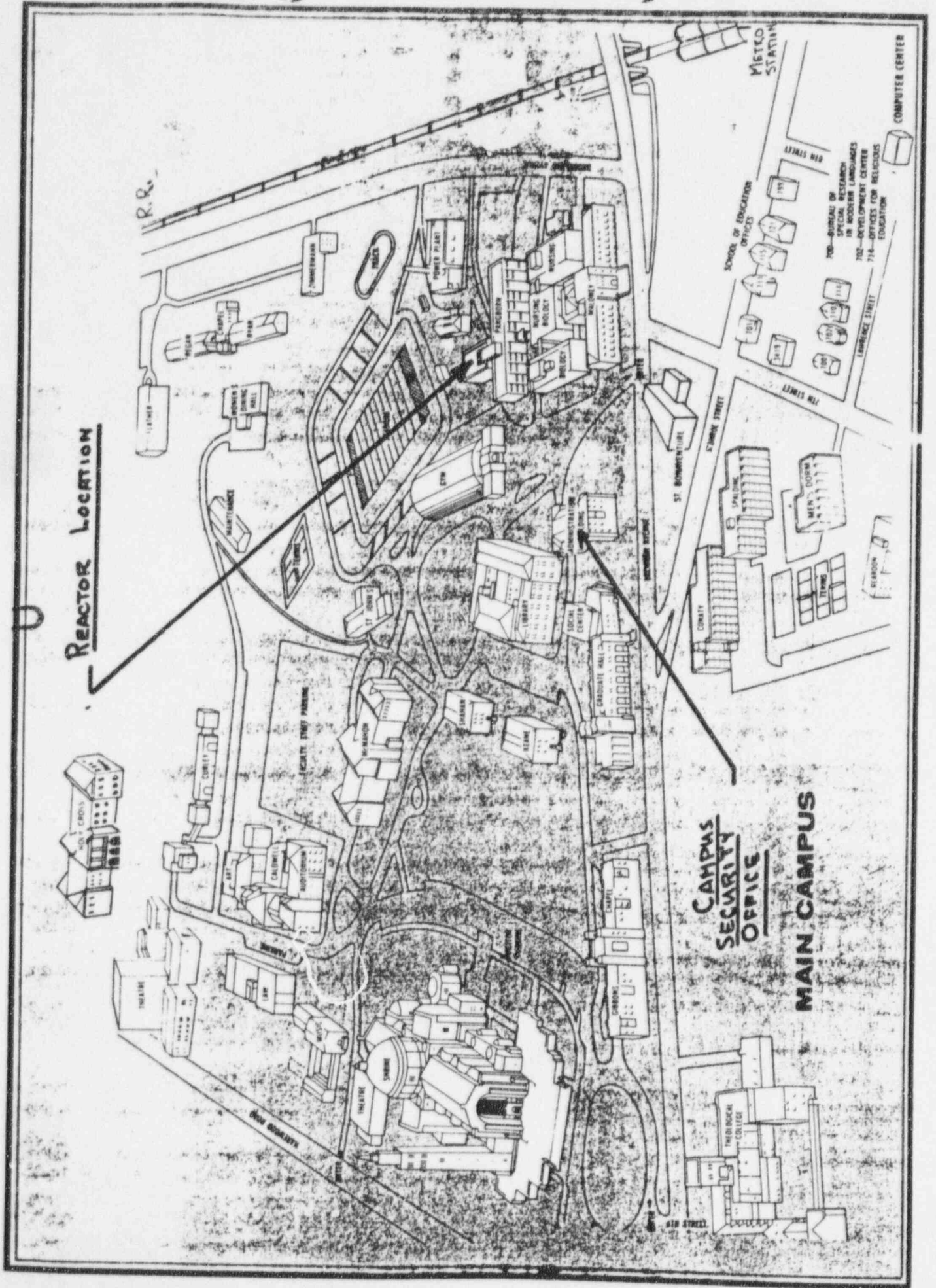
1:50,000 - 3235 (11-1-1970)



- |  |    |  |    |
|--|----|--|----|
| Administration Building                        | B4 | Stairway Hall                                    | B4 |
| Admissions/Financial Aid (McMahon Hall)        | C3 | St. Vincent Bazaar/CUA                           | A4 |
| Alumni Center                                  | C2 | St. Vincent Library                              | B5 |
| Architecture                                   | B4 | St. Vincent Library                              | A5 |
| The Brannon T. Bone School of Music, Ward Hall | C3 | The Reverend Shrine of the Immaculate Conception | B4 |
| Cardwell Hall                                  | C2 | Newman Bazaar/1278                               | C4 |
| Carroll College                                | C2 | North Dining Hall                                | B3 |
| Carroll Building                               | A5 | O'Boyle Hall                                     | C2 |
| Conventual Village                             | B3 | Pearlman Hall                                    | B4 |
| The Columbus School of Law                     | B5 | Francis Phelan                                   | B4 |
| Conroy Hall                                    | B5 | Psychics Plaza                                   | B4 |
| CUA Bookstore                                  | C3 | Raymond A. Dufour (Lithology) Center             | B1 |
| Corner Hall                                    | C3 | Reagan Hall                                      | B5 |
| Department of Studies                          | C3 | Ryan Hall  | B2 |
| Executive Office Building                      | C2 | Sacred Heart                                     | B2 |
| Father Hall                                    | B2 | Saint Bonaventure Hall                           | B4 |
| Gibbons Hall, School of Nursing                | B4 | Saint John's Hall                                | B4 |
| Hamman Hall                                    | C5 | Saint Vincent de Paul Chapel                     | B4 |
| Heights  | B2 | Saint Regis Hall                                 | B4 |
| Heights Apartments                             | C1 | Sheehan Hall                                     | B4 |
| Inter-cultural Center                          | B5 | Sheehan Hall                                     | B4 |
| Kearney Hall                                   | B4 | Sheehan Hall                                     | B4 |
| Life Cycle Institute                           | B4 | Sheehan Hall                                     | B4 |
| Marion Historical Bank                         | B4 | Sheehan Hall                                     | B4 |
| Marion Hall                                    | C2 | Sheehan Hall                                     | B4 |
| Marion Scholastic                              | C2 | Sheehan Hall                                     | B4 |
| McCormac Ward Building                         | C3 | Sheehan Hall                                     | B4 |
| McMahon Hall                                   | B4 | Sheehan Hall                                     | B4 |



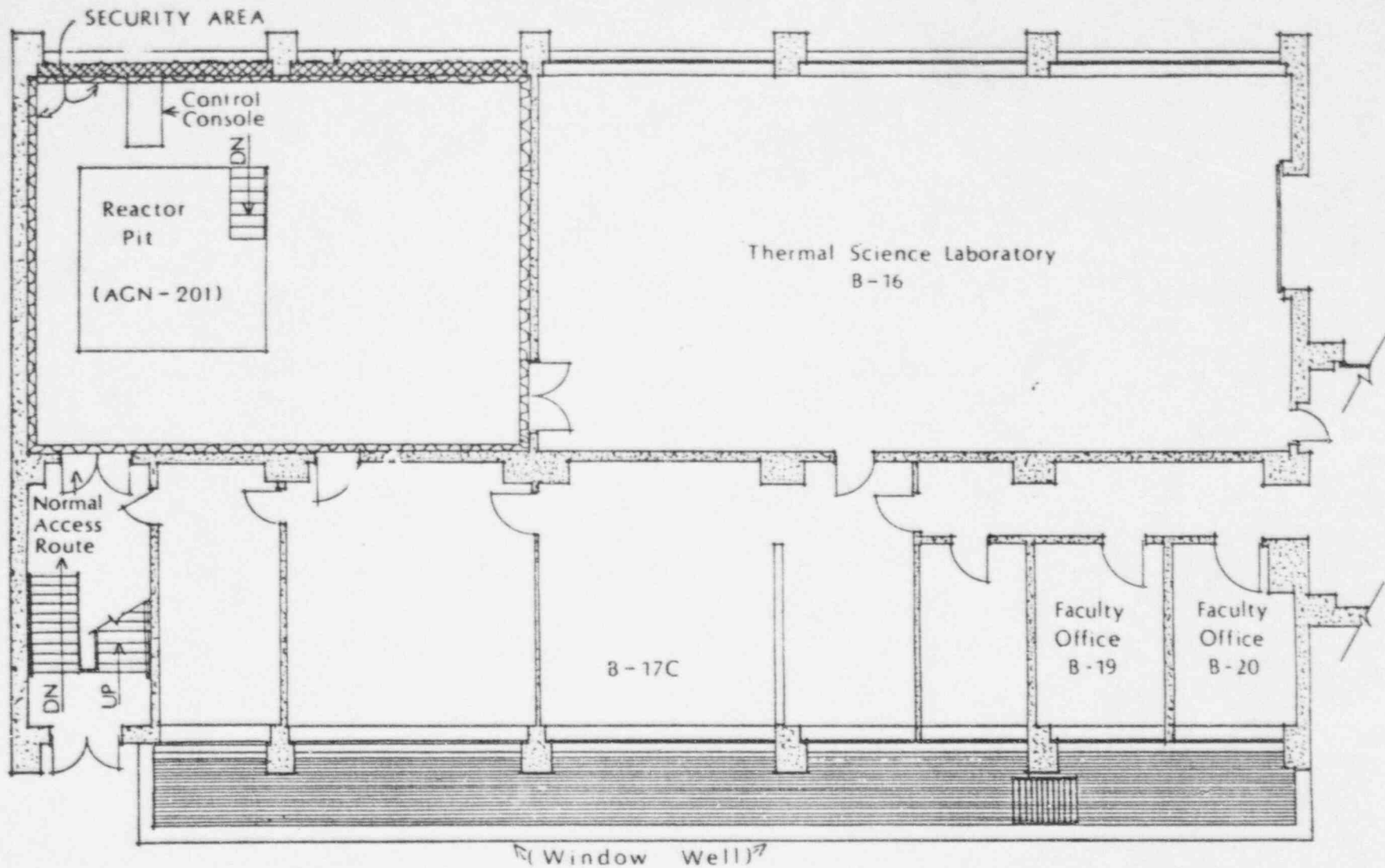
FIGURE 2



The Catholic University of America

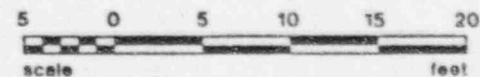
Figure 3

Campus Map



THE  
CATHOLIC UNIVERSITY  
OF AMERICA

NUCLEAR REACTOR ROOM (B-16R PANGBORN HALL)



North arrow pointing up and the text 'Date:'

FIGURE  
4

## 4.0 DECOMMISSIONING METHODOLOGY

### 4.1 Objective Implementation and Decommissioning Activities

In order to realize the objectives defined in 1.3, CUA has planned and implemented decommissioning activities incorporating:

- Removal of the thermal shield, lead shielding, graphite reflector, fuel and all drive mechanisms and associated reactor mechanical parts.
- Removal of all cinder blocks used for security enhancement.
- Removal of reactor console, furniture, and support equipment.
- Cleaning of all surfaces.

### 4.2 Preliminary Surveys

Routine radiation surveys, required during reactor operations, have not detected any contamination. These surveys were continued subsequent to defueling and continued to show no evidence of contamination. All disassembled reactor components have been surveyed and dispositioned in accordance with the approved decommissioning plan. No fixed or removable contamination was identified.

Preliminary surveys taken for removable contamination on floors, upper surfaces and the reactor tank did not show any results above background.

## 5.0 FINAL STATUS SURVEYS

### 5.1 Survey Design

In preparation for the final status surveys, the reactor room has been divided into two subunits: (1) lower surfaces, comprised of floor surfaces, wall surfaces up to a height of 2 meters, and any other surface easily accessible to a technician standing on the floor; and (2) overhead surfaces, comprised of ceiling surfaces, wall surfaces more than 2 meters above the floor, and all other surfaces not described in (1).

The floors and lower walls have been divided, using a rectangular grid system, into one by one meter areas. In this report, the blocks formed in this manner are referred to as "survey blocks" and the corners of the blocks formed by the intersecting lines are referred to as "grid points."

## 5.1 Survey Design (con't)

The reactor steel tank and its support structure are the only reactor components remaining in the room and remain in the pit previously described. The catwalk and pit railing remain in place for safety purposes. The surfaces have been divided into approximately 1 meter square blocks, using grid point locators, and surveyed.

## 5.2 Final Status Surveys

The approved decommissioning plan described the following termination radiation surveys to be taken:

In the reactor facility, all surface areas larger than one square meter will be marked off in a grid of one meter square blocks. The survey will include a wipe sample of 100 cm<sup>2</sup> (nominal) taken within each block to identify removable contamination. Wipes for each grid location will be counted for alpha and beta contamination. Limits for removable contamination will be 200 dpm/100 cm<sup>2</sup> (beta/gamma) and 20 dpm/100cm<sup>2</sup> (alpha) (RG 1.86). A beta-gamma survey also will be performed centered on each block at a distance of one meter from the surface. Residual radioactivity will be considered acceptable if measurements so-made are not more than 5 uR/h above background, where the reference background value is obtained as the highest of corresponding measurements of similar structural material made elsewhere in Pangborn Hall.

In addition to the above described surveys, direct reading measurements for surface alpha and beta/gamma contamination were taken on lower surfaces.

Operating history, past routine surveys, preliminary scans, and the final status surveys described above, provide demonstrable evidence that there is no reason to suspect surface residual activity exceeding 25% of the guideline values on floor surfaces.

Therefore, a statistically significant number of grid blocks have been directly surveyed (at least 30 grid blocks) to assure reasonable coverage of these surfaces.

For upper surfaces, a minimum of 30 measurement locations were surveyed, biased to locations where radioactivity, if present, would be most likely to accumulate.

### 5.3 Final Contamination Measurements

#### 5.3.1 Fixed Beta/Gamma Measurements

Fixed beta-gamma readings were taken within designated grid blocks. A static count for 1 minute was converted to dpm/100 cm<sup>2</sup> by taking the net counts and multiplying by a factor which corrects for 4 pi efficiency of the probe and the active area of the detector. Effective window area for this probe is approximately 12 cm<sup>2</sup>. The minimum detectable level, based on typical background counts of 20-40 cpm for this detector, is approximately 980-1200 dpm/100 cm<sup>2</sup>.

#### 5.3.2 Wipe Measurements

Wipe measurements (indirect surveys) were performed using numbered filter paper disks which were then placed in labeled smear booklets with the item/location recorded. Each wipe was counted in a low background gas proportional counting system. The minimum detectable activity calculated for this system as set up for processing these smears is approximately 10 dpm where there is a 5% chance that a smear with this activity will be counted as less than the MDA and a 5% chance that the smear with zero activity will be counted as exceeding the MDA.

#### 5.3.3 Fixed Alpha Measurements

Measurements for fixed alpha activity were performed in designated grid blocks. Static 1 minute counts were converted to disintegration rates (dpm/100 cm<sup>2</sup>) by multiplying the net CPM by a factor which corrected for the 4 pi efficiency of the probe and the active area of the detector. Effective window area for the alpha probe was approximately 50 cm<sup>2</sup>.

The minimum detection level for this alpha probe coupled to scaler/ratemeter and operated in the scaler mode is approximately 100 dpm/100 cm<sup>2</sup>

### 5.4 Exposure Rates at 1 Meter From Floor and Lower Wall Surfaces

#### 5.4.1 Establishment of Background Radiation Exposure:

In order to insure that the final radiation survey is based upon appropriate levels of background radiation, an area of similar materials of construction and configuration, known to be free of any potential contamination were selected for measurement evaluation.

The same instruments used for the final survey were used to construct a series of background readings. These readings were then averaged for each selected area.

#### 5.4.2 Establishment of Decommissioning Area External Radiation Exposures

External radiation surveys were conducted in survey units identified in this report as the Reactor Room and Reactor Pit (Appendix A), and (Appendix B), respectively.

As described in 5.2 a reading was taken centered over each grid block at one meter above the surface using a micro-R scaled ratemeter. For those floor survey blocks adjacent to walks, the measurement was taken at the appropriate grid point which maintained a 1 meter distance from the wall.

#### 5.5 Instrumentation Used

##### Direct Radiation Measurements

Ludlum Instrumentation Corporation, Santa Fe, New Mexico

- Model 3 Survey Meter
- Model 12 Survey Meter
- Model 19 Micro R Survey Meter
- Model 43-2 Alpha Scintillation Detector
- Model 43-65 Alpha Scintillation Detector
- Model 44-9 "Pancake" G-M Detector
- Model 2221 Single Channel Analyzer, Scaler/Ratemeter

##### Indirect Measurements

Tennelec, Incorporated, Oak Ridge, Tennessee

- Model LB 5100 Low Background Counting System

#### 6.0 Final Status Survey Results Compared to Compliances Criteria

##### 6.1 Final Status Survey Results

The final status survey results for the reactor room (Pangborn B16 R) and the reactor pit/reactor steel tank, located within this room, have been grouped separately and are attached to this report within Appendix A and Appendix B respectively.

##### 6.2 Compliance Criteria

The decommissioning criteria for surface contamination has been established in the decommissioning plan and NRC Regulatory Guide 1.86. The decommissioning criteria for external exposure measured at 1 meter from surfaces has also been established in the decommissioning plan and for this facility can not exceed 5 micro-R/hour gamma above background.

### 6.3 Comparison of Final Status Survey Results to Compliance Criteria

The survey data in Appendix A and Appendix B verify that final residual surface contamination and external radiation levels measured at 1 meter from surfaces meet the acceptable compliance criteria as specified in the approved decommissioning plan and NRC Regulatory Guide 1.86 titled "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material.

The general surface activity and exposure rate guideline values are average values, above background, established for areas of survey unit surfaces and indoor exposure rates.

In order to compare survey data with the guideline limits, the mean of each type of measurement taken on lower surfaces, (reactor room and pit floors; reactor room walls up to two meters and all pit walls) has been calculated using all measurements taken on those lower surfaces.

Figures 5 and 6 illustrate this comparison.



SUMMARY SHEET  
RADIATION EXPOSURE RATE ANALYSIS  
(uR/hr at 1 Meter)

SURVEY UNIT	EXPOSURE RATE ABOVE BACKGROUND AT 1 METER uR/hr	COMPLIANCE LIMIT uR/hr
-------------	---	------------------------------

REACTOR ROOM	0.3	5
REACTOR PIT	0.0	5

FIGURE  
5

SUMMARY SHEET  
SURFACE CONTAMINATION ANALYSIS

DPM/100 CM2

SURVEY UNIT	REMOVABLE BETA	REMOVABLE ALPHA	FIXED BETA/GAMMA	FIXED ALPHA
LIMIT	200	20	5000	5000

REACTOR RM	2	1	62	8
------------	---	---	----	---

FIGURE  
6

APPENDIX A REACTOR ROOM

FINAL STATUS SURVEYS

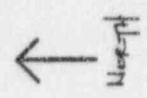
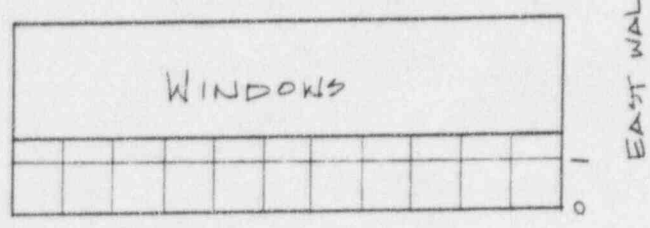
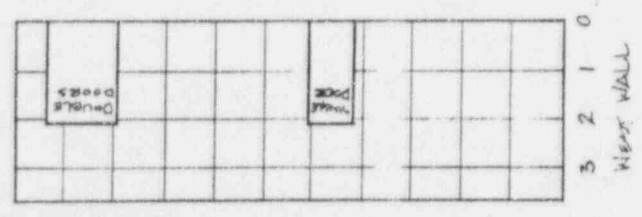
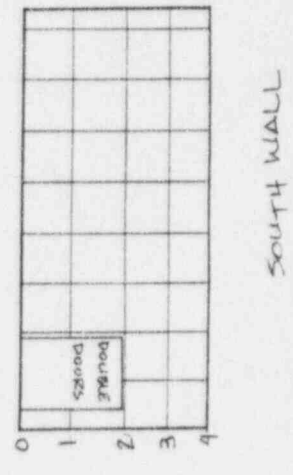
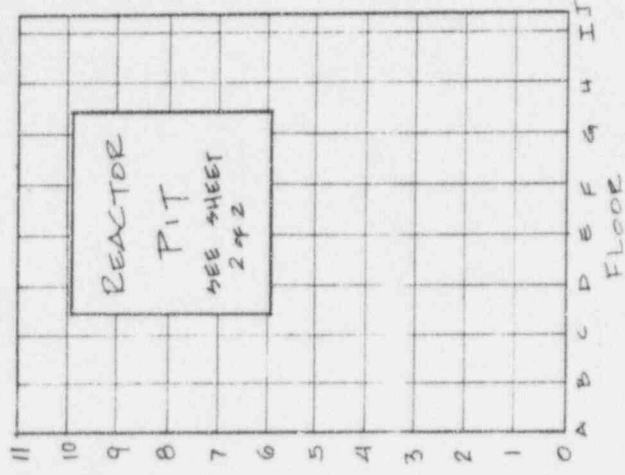
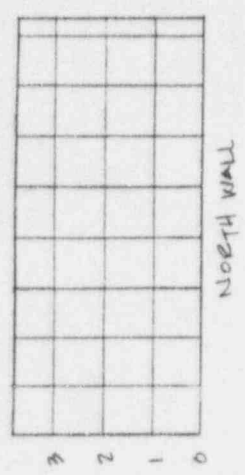
Reference: Grid Map A-1

	PAGE
* Lower Surfaces-Indirect Measurements	A1--A8
* Upper Surfaces-Indirect Measurements	A9--A11
* Lower Surfaces-Direct Measurements	A12--A13
* Lower Surfaces-External Radiation at 1 Meter	A14--A17

REACTOR ROOM

- GRID MAP A-1 -

PANGBORN RM B-16R  
REACTOR ROOM  
DECOMMISSIONING



SCALE 1:100 (METERS)

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

**REACTOR ROOM FLOOR  
GRID BLOCKS MAP A-1**

Object or Area Surveyed

THU NOV 17, 1994

GROUP A FINAL STATUS SURVEY-REACTOR ROOM

**COLUMN  
A BLOCKS**

RECOUNT  
A-0

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	0	16	-0.40	16.40	-1.1111111	49.411765
1	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
2	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
3	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
4	1.00	1	2	0.60	1.40	1.6666667	4.1176471
5	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
6	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
7	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
8	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
9	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
10	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706

THU NOV 18, 1994

GROUP A RECOUNT SURVEY-REACTOR ROOM: ROW B SURVEY BLOCKS

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	1	2	0.60	1.40	1.6666667	4.1176471

**COLUMN  
B BLOCKS**

RECOUNT  
B-0

THU NOV 17, 1994

GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW B SURVEY BLOCKS

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	1	17	0.60	16.40	1.6666667	49.231194
1	1.00	1	2	0.60	1.40	1.6666667	4.1176471
2	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
3	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
4	1.00	1	1	0.60	0.40	1.6666667	1.1764706
5	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
6	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
7	1.00	2	3	1.60	2.60	4.4444444	7.0588235
8	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
9	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706

THU NOV 17, 1994

GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW B SURVEY BLOCKS

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	1	0	0.60	-0.60	1.6666667	-1.7647059

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR α β

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND α β

THU NOV 17, 1994

Object or Area Surveyed

GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW C SURVEY BLOCKS

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	1	1	0.60	0.40	1.6666667	1.1764706
1	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
2	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
3	1.00	1	0	0.60	-0.60	1.6666667	-1.7647059
4	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
5	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
6	1.00	0	0	-0.40	0.60	-1.1111111	1.7647059
7	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
8	1.00	0	0	-0.40	0.60	-1.1111111	-1.7647059
9	1.00	0	0	-0.40	0.60	-1.1111111	-1.7647059
10	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059

COLUMN  
C

FRI NOV 18, 1994

GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW D SURVEY BLOCKS

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
1	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
2	1.00	1	2	0.60	1.40	1.6666667	4.1176471
3	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
4	1.00	2	0	1.60	0.60	4.6666666	1.7647059
5	1.00	0	2	0.40	1.40	1.1111111	4.1176471
6	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235

COLUMN  
D

FRI NOV 18, 1994

GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW E SURVEY BLOCKS

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
1	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
2	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
3	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
4	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
5	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
6	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059

COLUMN  
E

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
 SURVEYED BY \_\_\_\_\_  
 COUNTER NUMBER \_\_\_\_\_  
 EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
 DATE \_\_\_\_\_  
 BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

Object or Area Surveyed

FRI NOV 18, 1994

GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW F SURVEY BLOCKS

COLUMN  
F

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	0	3	-0.40	2.40	-1.1111111	7.0566235
1	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
2	1.00	1	2	0.60	1.40	1.6666667	4.1176471
3	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
4	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
5	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
6	1.00	0	4	-0.40	3.40	-1.1111111	10

FRI NOV 18, 1994

GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW G SURVEY BLOCKS

COLUMN  
G

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
1	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
2	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
3	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
4	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
5	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
6	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
7	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
8	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
9	1.00	1	0	0.60	0.00	1.6666667	1.7647059
10	1.00	1	0	0.60	-0.60	1.6666667	-1.7647059

FRI NOV 18, 1994

GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW H SURVEY BLOCKS

COLUMN  
H

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
0	1.00	1	0	0.60	-0.60	1.6666667	-1.7647059
1	1.00	2	1	1.60	0.40	4.4444444	1.1764706
2	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
3	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
4	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
5	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
6	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
7	1.00	2	5	1.60	4.00	4.4444444	12.941176
8	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
9	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
10	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  B

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  B

Object or Area Surveyed

FRI NOV 25, 1994

GROUP A FINAL STATUS SURVEY REACTOR ROOM: ROW 1 SURVEY SLICES

SAMPLE	TIME	ALPHA	BETA	ALPHA	BETA	ALPHA	BETA
SN CODE	(MIN.)	COUNTS	COUNTS	CFM	CFM	CORRECTED	CORRECTED
<b>COLUMN</b>							
<b>I</b>							
0	1.00	0	0	-0.40	-0.60	-1.11111111	-1.7647059
1	1.00	0	2	-0.40	1.40	-1.11111111	4.1176471
2	1.00	0	0	-0.40	-0.60	-1.11111111	-1.7647059
3	1.00	0	1	-0.40	0.40	-1.11111111	1.1764706
4	1.00	0	0	-0.40	-0.60	-1.11111111	-1.7647059
5	1.00	1	1	0.60	0.40	1.88888889	1.1764706
6	1.00	0	1	-0.40	0.40	-1.11111111	1.1764706
7	1.00	0	5	-0.40	4.00	-1.11111111	12.941176
8	1.00	0	2	-0.40	1.40	-1.11111111	4.1176471
9	1.00	0	1	0.40	0.40	-1.11111111	1.1764706
10	1.00	0	0	0.40	-0.60	-1.11111111	-1.7647059



HEALTH PHYSICS  
SMEAR SURVEY RECORD

CUA



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

REACTOR ROOM WALLS

Object or Area Surveyed

NORTH  
O ROW

A, II, 0  
B  
C  
D  
E  
F  
G  
H  
I, II, 0

WED DEC 07, 1994

GROUP A NORTH WALL: LOWER SURFACES, LOWER 1 SQ. METER BLOCKS-REACTOR ROOM

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
1	1.00	1	0	0.60	-0.60	1.666667	-1.764706
2	1.00	1	1	0.60	0.40	1.666667	1.1764706
3	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
4	1.00	1	1	0.60	0.40	1.666667	1.1764706
5	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
6	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
7	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
8	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
9	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706

NORTH  
I ROW

A, II, 1  
B  
C  
D  
E  
F  
G  
H  
I, II, 1

WED DEC 07, 1994

GROUP B NORTH WALL: LOWER SURFACES, UPPER 1 SQ. METER BLOCKS-REACTOR ROOM

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
10	1.00	1	4	0.60	1.60	1.666667	2.7777778
11	1.00	1	1	0.60	0.40	1.666667	1.1764706
12	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
13	1.00	1	4	0.60	1.60	1.666667	2.7777778
14	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
15	1.00	1	1	0.60	1.40	1.666667	4.1176471
16	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
17	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
18	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706

HEALTH PHYSICS  
SMEAR SURVEY RECORD

CUA



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  B

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  B

Object or Area Surveyed

WED DEC 07, 1994

GROUP C EAST WALL: LOWER SURFACES, LOWER 1 SQ. METER BLOCKS-REACTOR ROOM

SN	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA (CORRECTED)	BETA (CORRECTED)
<b>EAST</b>							
<b>0 ROW</b>							
I+0.4, 11, 0	19	1.00	2	0	1.60	4.4664444	-1.7647059
	20	1.00	2	0	1.60	4.4664444	-1.764706
	21	1.00	0	1	-0.40	-1.1111111	-1.764706
	22	1.00	0	3	0.40	-1.1111111	7.0588235
	23	1.00	0	0	-0.40	-1.1111111	-1.7647059
	24	1.00	0	1	-0.40	-1.1111111	-1.764706
	25	1.00	1	0	0.60	1.6666667	-1.7647059
	26	1.00	1	2	0.60	1.6666667	4.1176471
	27	1.00	0	0	-0.40	-1.1111111	-1.7647059
	28	1.00	0	3	-0.40	-1.1111111	7.0588235
I+0.4, 1, 0	29	1.00	0	0	-0.40	-1.1111111	-1.7647059

HEALTH PHYSICS  
SMEAR SURVEY RECORD

CUA



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

Object or Area Surveyed

WED DEC 07, 1994

GROUP A SOUTH WALL: LOWER SURFACES,

SOUTH  
O ROW  
A, 0 →  
I, 0

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
1	1.00	0	3	-0.40	2.40	-1.1111111	7.0556235
2	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
3	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
4	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
5	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
6	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
7	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
8	1.00	1	2	0.60	1.40	1.6666667	4.1176471
9	1.00	1	2	0.60	1.40	1.6666667	4.1176471

WED DEC 07, 1994

GROUP B SOUTH WALL: LOWER SURFACE, UPPER 1 SQ. METER BLOCKS- REACTOR ROOM

SOUTH  
I ROW  
A, 0 →  
I, 0

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
10	1.00	1	0	1.60	-0.60	4.4444444	-1.7647059
11	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
12	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
13	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
14	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
15	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
16	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
17	1.00	2	2	1.60	1.40	4.4444444	4.1176471
18	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471

HEALTH PHYSICS  
SMEAR SURVEY RECORD

CUA



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

Object or Area Surveyed

WED DEC 07, 1994

GROUP C WEST WALLS: WEST SURFACES, LOWER 1 SQ. METER PLACES--REACTOR ROOM

WEST  
0 ROW

A, 0 →  
A, 10

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
19	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
20	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
21	1.00	1	1	0.60	0.40	1.0000000	1.1764706
22	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
23	1.00	1	0	1.60	-0.60	4.4444444	-1.7647059
24	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
25	1.00	1	1	0.60	0.40	1.0000000	1.1764706
28	1.00	3	2	2.60	1.40	1.0000000	4.1176471
27	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
26	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
29	1.00	1	2	0.60	1.40	1.0000000	4.1176471
30	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471

WED DEC 07, 1994

GROUP A WEST WALL: LOWER SURFACES, UPPER 1 SQ. METER PLACES--REACTOR ROOM

WEST  
1 ROW

A, 0 →  
A, 10

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
1	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
2	1.00	1	1	0.60	0.40	1.0000000	1.1764706
3	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
4	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
5	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
6	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
7	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
8	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
9	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
10	1.00	2	2	1.60	1.40	4.4444444	4.1176471
11	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235


## Upper Surfaces-Indirect Measurements

SN	Reference to Grid	Area-Item Survey
1	A0	Top steam line
2	A0	Air line pipes
3	A0	Light fixture
4	A1	Air line valve
5	A2	Steam pipe
6	A4	Top of door ledge
7	A5	Faucet
8	A5	Alarm bell
9	A5	Coiled wires
10	A8	Fire extinguisher
11	A8	ADT box
12	A8	Steam line support hanger
13	A9	Top of door ledge
14	A9	Exit sign
15	A10	Top of pipe hanger
16	C10	Power box
17	D2	Light fixture
18	D5	Light bulb fixture
19	I3	Power line
20	I4	Radiator
21	I5	Air conditioner
22	I7	Gas lines
23	I10	valves
24	F10	Ceiling
25	B4	Ceiling
26	B9	Ceiling
27	G5	Ceiling
28	H7	Ceiling
29	I2	Window sill

30	I6	Window sill
31	I8	Window frame
32	I10	Window frame
33	E0	South wall above 2 meters
34	I0	South wall above 2 meters

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
 SURVEYED BY \_\_\_\_\_  
 COUNTER NUMBER \_\_\_\_\_  
 EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
 DATE \_\_\_\_\_  
 BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

REACTOR ROOM  
UPPER SURFACES

Object or Area Surveyed

FRI DEC 09, 1994

GROUP A Upper Surfaces: Indirect Surveys-Ceiling/Walls/Structurals

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
1	1.00	0	6	-0.40	5.40	-1.1111111	15.882353
2	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
3	1.00	1	0	0.60	-0.60	1.6666667	-1.7647059
4	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
5	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
6	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
7	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
8	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
9	1.00	1	2	0.60	1.40	1.6666667	4.1176471
10	1.00	3	2	2.60	1.40	7.2222222	4.1176471
11	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
12	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
13	1.00	1	1	0.60	0.40	1.6666667	1.1764706
14	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
15	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
16	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
17	1.00	1	3	0.60	2.40	1.6666667	7.0588235
18	1.00	1	2	0.60	1.40	1.6666667	4.1176471
19	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
20	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
21	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
22	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
23	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
24	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
25	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
28	1.00	2	0	1.60	-0.60	4.6666667	-1.7647059
27	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
26	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
29	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
30	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
31	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
32	1.00	1	1	0.60	0.40	1.6666667	1.1764706
33	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
34	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235

A 11



DECONTAMINATION AND DECOMMISSIONING SURVEY DATA

Pangborn B-16R, Reactor Room	A-1
BUILDING & AREA	DRAWING No.

SURVEY BLOCK DESIGNATION	Ludlum 2221 Scaler/Ratemeter; Ludlum 44-9 Probe			
	DIRECTLY MEASURED			
	COUNTS/1 MIN./PROBE		DPM/100 CM <sup>2</sup>	
	GROSS	NET	BETA-GAMMA	
B-0	22	0		0
D-0	30	0		0
G-0	22	0		0
H-0	30	0		0
C-1	34	4		136
F-1	24	0		0
H-1	32	2		68
E-2	31	1		34
A-3	30	0		0
D-3	24	0		0
F-3	20	0		0
H-3	28	0		0
E-4	17	0		0
G-4	27	0		0
C-5	26	0		0
F-5	22	0		0
H-5	25	0		0
A-6	36	6		204
H-6	28	0		0
A-10	31	1		34
B-8	39	9		306
H-8	26	0		0
B-9	38	8		272
D-10	31	1		34
F-10	46	16		544
H-10	26	0		0

SHEET \_\_\_\_\_ of \_\_\_\_\_



DECONTAMINATION AND DECOMMISSIONING SURVEY DATA



Pangborn B16R, Reactor Room	A-1
BUILDING & AREA	DRAWING No.

SURVEY BLOCK DESIGNATION	Ludlum 2221 Scaler/Ratemeter; Ludlum 43-65 Probe			
	DIRECTLY MEASURED			
	Counts/1 Min./Probe		DPM/100 cm <sup>2</sup>	
	GROSS	NET		ALPHA
B-0	3	0		0
D-0	6	2		13
G-0	5	1		7
H-0	9	5		34
C-1	4	0		0
F-1	6	2		13
H-1	1	0		0
E-2	5	1		7
A-3	3	0		0
D-3	10	6		40
F-3	1	0		0
H-3	6	2		13
E-4	7	3		20
G-4	5	1		7
C-5	3	0		0
F-5	9	5		33
H-5	0	0		0
A-6	6	2		13
H-6	4	0		0
A-10	7	3		20
B-8	4	0		0
H-8	4	0		0
B-9	5	1		7
D-10	1	0		0
F-10	1	0		0
H-10	5	1		7

SHEET \_\_\_\_\_ of \_\_\_\_\_

RADIATION EXPOSURE RATE ANALYSIS  
Micro R/hr at 1 Meter

AREA	Reactor Room, Pangborn Hall B16-R
INSTRUMENT	Ludlum Model 19 S/N 82787
BACKGROUND-SIMILAR CONSTRUCTION:	Pangborn B-16, 5.5 micro-R/hr

GRID POINT/BLOCK	MICRO-R/Hr
B 1*	6.0
B 2*	6.2
B 3*	6.0
B 4*	5.2
B 5*	6.0
B 6*	6.2
B 7*	6.8
B 8*	6.0
B 9*	7.0
B 10*	7.2
B 1	5.0
B 2	5.0
B 3	5.2
B 4	5.0
B 5	6.0
B 6	6.0
B 7	6.3
B 8	6.0
B 9	7.0

Note: \* = Measurement taken over gridpoint;  
remainder of readings taken over  
gridblock center as located by  
lower left gridpoint.

RADIATION EXPOSURE RATE ANALYSIS  
Micro R/hr at 1 Meter

AREA    Reactor Room, Pangborn Hall B16-R
INSTRUMENT    Ludlum Model 19    S/N 82787
BACKGROUND-SIMILAR CONSTRUCTION: Pangborn B-16, 5.5 micro-R/hr

GRID POINT/BLOCK	MICRO-R/Hr
C 1*	5.7
B 1	5.0
B 2	5.0
B 3	5.2
B 4	5.0
B 5	6.0
B 6	6.0
B 7	6.3
B 8	6.0
B 9	7.0
C 1	5.0
C 2	5.2
C 3	5.5
C 4	5.5
C 5	5.2
C 10*	7.8
D 1*	5.0
D 1	5.0
D 2	5.0
D 3	4.7

Note: \* = Measurement taken over grid point;  
remainder of readings taken over grid block  
center as located by lower left grid point

RADIATION EXPOSURE RATE ANALYSIS  
Micro R/hr at 1 Meter

AREA	Reactor Room, Pangborn Hall B 16-R
INSTRUMENT	Ludlum Model 19 S/N 82787
BACKGROUND-SIMILAR CONSTRUCTION:	Pangborn B-16, 5.5 micro-R/hr

GRID POINT/BLOCK	MICRO-R/Hr
D 4	4.5
D 5	5.0
D 10*	8.0
E 1*	5.0
E 1	5.0
E 2	5.5
E 3	5.5
E 4	5.5
E 5	5.0
E 10*	7.2
F 1*	5.0
F 1	5.7
F 2	5.7
F 3	5.5
F 4	5.0
F 5	5.2
F 10*	8.0
G 1*	5.2
G 1	5.5
G 2	5.2

Note: \* = Measurement taken over grid point;  
remainder of readings taken over grid  
block center as located by lower left grid point.

RADIATION EXPOSURE RATE ANALYSIS  
Micro R/hr at 1 Meter

AREA	Reactor Room, Pangborn Hall B16-R
INSTRUMENT	Ludlum Model 19 S/N 82787
BACKGROUND-SIMILAR CONSTRUCTION:	5.5 micro R/hr

GRID POINT/BLOCK	MICRO-R/Hr
G 3	5.2
G 4	5.7
G 5	5.7
G 10	7.5
H 1*	5.5
H 1	6.0
H 2	5.2
H 3	5.7
H 4	5.7
H 5	6.0
H 6	7.0
H 7	7.0
H 8	7.0
H 9	7.2
I 10*	7.5

Note: \* = Measurement taken over grid point; remainder of readings taken over grid block center as located by lower left grid point.

AVERAGED ROOM MEASUREMENTS: 5.8 uR/hr
---------------------------------------

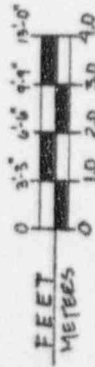
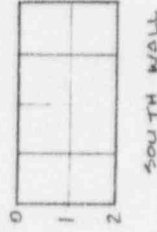
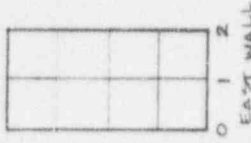
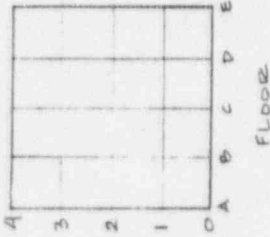
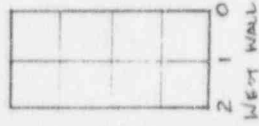
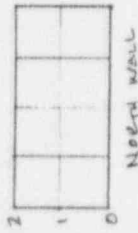
APPENDIX B REACTOR PIT  
FINAL STATUS SURVEYS

Reference: Grid Map B-1

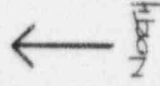
	PAGE
* Floor Surfaces-Indirect & Direct Measurements	B1--B3
* Wall Surfaces-Indirect Measurements	B4--B5
* Structure Surfaces	B6--B16
* External Radiation Survey at 1 Meter	B17

REACTOR PIT

- GRID MAP B-1 -



SCALE 1:100 (METERS)



PANGBEN RM. B-16A  
REACTOR ROOM  
DECOMMISSIONING

LDC

HEALTH PHYSICS  
SMEAR SURVEY RECORD

**CUA**



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

**REACTOR PIT FLOOR  
GRID BLOCKS MAP B-1**

Object or Area Surveyed \_\_\_\_\_

TUE DEC 06, 1994

GROUP A Floor of the Reactor Pit

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
A 0	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
A 1	1.00	1	3	0.60	2.40	1.6666667	7.0588235
A 2	1.00	1	0	0.60	-0.60	1.6666667	-1.7647059
A 3	1.00	1	3	0.60	2.40	1.6666667	7.0588235
B 0	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
B 1	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
B 2	1.00	0	0	0.40	-0.60	-1.1111111	-1.7647059
B 3	1.00	1	1	0.60	0.40	1.6666667	1.1764706
C 0	1.00	2	0	1.60	-0.60	4.4444444	-1.7647059
C 1	1.00	1	1	0.60	0.40	1.6666667	1.1764706
C 2	1.00	0	2	-0.40	1.60	-1.1111111	4.1176471
C 3	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
D 0	1.00	0	1	0.40	0.40	1.1111111	1.1764706
D 1	1.00	0	1	0.40	0.40	1.1111111	1.1764706
D 2	1.00	0	2	0.40	1.60	1.1111111	4.1176471
D 3	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059



DECONTAMINATION AND DECOMMISSIONING SURVEY DATA



Pangborn B-16R, Reactor Pit	B-1
BUILDING & AREA	DRAWING No.

SURVEY BLOCK DESIGNATION	Ludlum 2221 Scaler/Ratemeter; Ludlum 44-9 Probe			
	DIRECTLY MEASURED			
	COUNTS/1MIN./PROBE		DPM/100 CM2	
				BETA-GAMMA
A-0	33	3	102	
C-0	21	0	0	
A-2	34	4	136	
D-3	23	0	0	

SHEET \_\_\_\_\_ of \_\_\_\_\_

DECONTAMINATION AND DECOMMISSIONING SURVEY DATA



Pangborn B16R, Reactor Pit	B-1
BUILDING & AREA	DRAWING No.

Ludlum 2221 Scaler/Ratemeter; Ludlum 43-65 Probe

SURVEY BLOCK DESIGNATION	DIRECTLY MEASURED			
	Counts/1 Min./Probe		DPM/100 cm <sup>2</sup>	
	GROSS	NET		ALPHA
	A-1	4	0	
A-3	2	0		0
C-1	2	0		0
D-4	4	0		0

SHEET \_\_\_\_\_ of \_\_\_\_\_

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
 SURVEYED BY \_\_\_\_\_  
 COUNTER NUMBER \_\_\_\_\_  
 EFF. FACTOR  $\alpha$  B

DATE \_\_\_\_\_  
 DATE \_\_\_\_\_  
 BACKGROUND  $\alpha$  B

- REACTOR PIT WALLS  
GRID MAP B-1 -

Object or Area Surveyed

TUE DEC 06, 1994

GROUP A North Wall of the Reactor Pit

NORTH	
A,4,1	
B,4,1	
C,4,1	
D,4,1	
A,4,0	
B,4,0	
C,4,0	
D,4,0	

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
1	1.00	1	3	0.60	2.40	1.6666667	7.0588235
2	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
3	1.00	2	1	1.60	0.40	4.4444444	1.1764706
4	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
5	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
6	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
7	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
8	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706

TUE DEC 06, 1994

GROUP A East Wall of the Reactor Pit

EAST	
E,4,1	
E,3,1	
E,2,1	
E,1,1	
E,4,0	
E,3,0	
E,2,0	
E,1,0	

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
1	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
2	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
3	1.00	1	1	0.60	0.40	1.6666667	1.1764706
4	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
5	1.00	1	4	0.60	2.40	1.6666667	7.0588235
6	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
7	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
8	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471


HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

Object or Area Surveyed

TUE DEC 06, 1994

GROUP A South Wall of the Reactor

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED	
<b>SOUTH</b>								
D, 0, 1	13	1.00	1	4	0.60	1.6666667	10	
C, 0, 1	14	1.00	0	1	-0.40	-1.1111111	1.1764706	
B, 0, 1	15	1.00	0	1	-0.40	-1.1111111	1.1764706	
A, 0, 1	16	1.00	1	1	0.60	1.6666667	1.1764706	
D, 0, 0	17	1.00	4	2	3.80	1.40	4.1176471	
C, 0, 0	18	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
B, 0, 0	19	1.00	1	2	0.60	1.40	1.6666667	4.1176471
A, 0, 0	20	1.00	1	1	0.60	0.40	1.6666667	1.1764706

**WEST**

TUE DEC 06, 1994

GROUP A West Wall of the Reactor Pit

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED	
<b>WEST</b>								
A, 0, 1	1	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
A, 1, 1	2	1.00	0	0	-0.40	-0.60	-1.1111111	1.7647059
A, 2, 1	3	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
A, 3, 1	4	1.00	3	1	2.60	0.40	7.2222222	1.1764706
A, 0, 0	5	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
A, 1, 0	6	1.00	0	3	-0.40	2.40	-1.1111111	7.0588235
A, 2, 0	7	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
A, 3, 0	8	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706

## Reactor Structure Surveys

• Pit Rail, Reactor Room [13' side : circumference of pipe : 4.5" equivalent 1 m<sup>2</sup>=28 ft]

SN	Area-Item Survey
1	South Side Top Rail
2	South Side Mid Rail
3	North Side Top
4	North Side Mid
5	East Side Top
6	East Side Mid
7	West Side Top and Mid

• Catwalk Railing (facing west)

SN	Area-Item Survey
8	Left Half Top
9	Left Half Mid
10	Number Not Used
11	Right Half Mid

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

- REACTOR STRUCTURES -

Object or Area Surveyed

FRI DEC 02, 1994

GROUP A PIT RAILING--REACTOR ROOM

PIT  
RAILING

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
1	1.00	1	9	0.60	6.40	1.7647059	14.705862
2	1.00	0	0	-0.40	0.60	-1.1764706	-1.7647059
3	1.00	0	0	-0.40	-0.60	-1.1764706	1.7647059
4	1.00	2	0	1.60	-0.60	4.7058624	-1.7647059
5	1.00	0	4	-0.40	3.40	-1.1764706	10
6	1.00	1	1	0.60	0.40	1.7647059	1.1764706
7	1.00	0	0	-0.40	-0.60	-1.1764706	-1.7647059

FRI DEC 02, 1994

GROUP A PIT RAILING--REACTOR ROOM

RECOUNTS

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
1	1.00	0	2	-0.40	1.40	1.1764706	4.1176471
5	1.00	1	1	0.60	0.40	1.7647059	1.1764706

FRI DEC 02, 1994

GROUP B CATWALK RAILING (FACING WEST), REACTOR ROOM

CATWALK  
RAILING

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
8	1.00	1	1	0.40	0.60	1.1111111	1.7647059
9	1.00	0	0	-0.60	-0.40	-1.6666667	-1.1764706
11	1.00	0	2	-0.60	1.60	-1.6666667	4.7058624


• Catwalk Platform (facing west)

SN	Area-Item Survey
12	Left Half
13	Left Half
14	Left half
15	Left Half
16	Right Half
17	Right Half
18	Right Half
19	Right half

• Steps down into Pit

SN	Area-Item Survey
1	Left Side Runner
2	Right Side Runner
3	Steps: Top two
4	Steps: Mid two
5	Steps: Bottom Three

• Catwalk Support Poles

SN	Area-Item Survey
6	North Pole Base
7	North Pole
8	East Pole base
9	East Pole
10	South Pole Base
11	South Pole
12	West Pole Base
13	West Pole

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  \_\_\_\_\_ *B*

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  \_\_\_\_\_ *B*

Object or Area Surveyed

FRI DEC 02, 1994

GROUP C CATWALK PLATFORM, (FACING WEST), REACTOR ROOM

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
<b>CATWALK PLATFORM</b>							
12	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
13	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
14	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
15	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
16	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
17	1.00	1	5	0.60	4.40	1.6666667	12.941176
18	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
19	1.00	2	1	1.60	0.40	4.4444444	1.1764706

MON DEC 05, 1994

GROUP A STAIRS DOWN INTO REACTOR PIT

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
<b>STAIRS</b>							
1	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
2	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
3	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
4	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
5	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706

MON DEC 05, 1994

GROUP B CATWALK SUPPORT POLES

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
<b>CATWALK POLES</b>							
6	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
7	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
8	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
9	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
10	1.00	1	0	0.60	-0.60	1.6666667	-1.7647059
11	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
12	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
13	1.00	2	1	1.60	0.40	4.4444444	1.1764706



• Reactor Tank (Shell), Top

SN	Area-Item Survey
14	Left Side First Quadrant
15	Left Side Second Quadrant
16	Right Side First Quadrant
17	Right Side Second Quadrant

• Reactor Tank (Shell), Middle

SN	Area-Item Survey
6	Left Half Block 1
5	Left Half Block 2
4	left Half Block 3
3	Right Half Block 4
2	Right Half Block 5
1	Right Half Block 6

• Reactor Tank (Shell), Bottom

SN	Area-Item Survey
7	Left Half First Quadrant
8	Left Half Second Quadrant
9	Right Half First Quadrant
10	Right Half Second Quadrant

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$    B  

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$    B  

Object or Area Surveyed

TANK  
TOP

MON DEC 05, 1994

GROUP C REACTOR SHELL (FACING WEST)

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
14	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
15	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
16	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
17	1.00	1	1	0.60	0.40	1.6666667	1.1764706

TANK  
MIDDLE

MON DEC 05, 1994

GROUP A REACTOR SHELL, MID 1/2 (SILVER) FACING WEST & SOUTH

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
6	1.00	0	0	0.40	0.40	-1.1111111	-1.7647059
5	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
4	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
3	1.00	0	0	0.40	0.40	-1.1111111	-1.7647059
2	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
1	1.00	0	2	-0.40	1.40	-1.1111111	4.1176471

TANK  
BOTTOM

MON DEC 05, 1994

GROUP B REACTOR SHELL (BOTTOM 1/4, GREEN) FACING WEST, SOUTH

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
7	1.00	1	1	0.60	0.40	1.6666667	1.1764706
8	1.00	0	0	0.40	0.40	-1.1111111	1.1764706
9	1.00	2	4	1.60	2.40	4.9999999	16
10	1.00	1	1	0.60	0.40	1.6666667	1.1764706


• Support Plate (on floor)

SN	Area-Item Survey
11	Outside Corner 1
12	Outside Corner 2
13	Outside Corner 3
14	Outside Corner 4
15	Inside First Half
16	Inside Second half

• Access Ports

SN	Area-Item Survey
1	Outside B.P. 2B
2	Outside B.P. 1B
3	Outside B.P. 3B
4	Outside B.P. 4B
5	Inside B.P. 2B
6	Inside B.P. 1B
7	Inside B.P. 3B
8	Inside B.P. 4B



• Access Ports

SN	Area-Item Survey
9	Outside B.P. 2A
10	Outside B.P. 1A
11	Outside B.P. 3A
12	Outside B.P. 4A
13	Inside B.P. 2A
14	Inside B.P. 1A
15	Inside B.P. 3A

• Glory Hole Access Port [1 $\frac{1}{4}$ "

SN	Area-Item Survey
16	S W Side Outside
17	S W Side Inside
18	N E Side Outside
19	N E Side Inside

HEALTH PHYSICS  
SMEAR SURVEY RECORD



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  \_\_\_\_\_  $\beta$  \_\_\_\_\_

MUN DEC 05, 1999

Object or Area Surveyed

GROUP B ACCESS PORTS: E.P. 2A, 1A, 3A, 4A: 1ST FOUR WIPES OUTSIDE, 2ND FOUR INSIDE

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
9	1.00	3	1	2.60	0.40	7.222222	1.176471
10	1.00	1	2	0.40	1.40	1.666667	4.117647
11	1.00	0	0	-0.40	-0.60	-1.111111	-1.764706
12	1.00	1	2	0.60	1.40	1.666667	4.117647
13	1.00	0	0	-0.40	-0.60	-1.111111	-1.764706
14	1.00	0	2	-0.40	1.40	-1.111111	4.117647
15	1.00	1	3	0.60	2.40	1.666667	7.058824

MUN DEC 05, 1999

GLORY HOLE

GROUP C GLORY HOLE: 1 INCH: TWO WIPES SW SIDE, OUTSIDE/INSIDE; TWO WIPES, NL SIDE, ONLY SW/ST

SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
16	1.00	0	2	-0.40	1.40	-1.111111	4.117647
17	1.00	1	1	0.40	0.40	1.666667	1.764706
18	1.00	1	1	0.40	0.40	1.666667	1.764706
19	1.00	0	0	0.40	0.40	1.111111	1.764706


HEALTH PHYSICS  
SMEAR SURVEY RECORD

CUA



COUNTED BY \_\_\_\_\_  
SURVEYED BY \_\_\_\_\_  
COUNTER NUMBER \_\_\_\_\_  
EFF. FACTOR  $\alpha$  B

DATE \_\_\_\_\_  
DATE \_\_\_\_\_  
BACKGROUND  $\alpha$  B

MAY DEC 05, 1996

GROUP A SAMPLE IS ROOM: WALL(S), GREY(S), GREEN(S)

Object or Area Surveyed	SAMPLE SN CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	ALPHA CORRECTED	BETA CORRECTED
WALL SAFE	1	1.00	0	1	0.40	0.40	1.11111111	1.1764706
EAST	2	1.00	0	4	0.40	3.40	1.11111111	10
FLOOR	3	1.00	0	3	0.40	2.40	1.11111111	7.0588235
SAFE	4	1.00	0	0	0.40	-0.60	1.11111111	-1.7647059
FLOOR	5	1.00	0	0	0.40	0.00	1.11111111	1.7647059
SAFE	6	1.00	0	0	0.40	-0.60	1.11111111	-1.7647059
FLOOR	7	1.00	0	0	0.40	0.00	1.11111111	1.7647059
SAFE	8	1.00	0	1	0.40	0.40	1.11111111	1.1764700

RADIATION EXPOSURE RATE ANALYSIS  
Micro R/hr at 1 Meter

AREA	Reactor Pit
INSTRUMENT	Ludlum Model 19 S/N 82787
BACKGROUND-SIMILAR CONSTRUCTION:	Poured concrete wall*, 5uR/hr

\* Similar pit not present on site

GRID POINT/BLOCK	MICRO-R/Hr
B 1*	4.0
B 2*	4.0
B 3*	4.0
C 1*	4.0
C 3*	4.0
D 1*	4.0
D 2*	4.0
D 3*	4.0

Note: \* = Measurement over grid point

Averaged Pit Measurements: 4.0 uR/hr
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