UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 11 1990

DOCKET NO: 70-734

LICENSEE: General Atomics (GA)
San Diego, California

SUBJECT: SAFETY EVALUATION REPORT, LICENSE AMENDMENT APPLICATION DATED NOVEMBER 17, 1989, RE RELEASE OF LABS

Background

By application dated November 17, 1989, GA requested that selected portions of Buildings 2 and 9 be released for unrestricted use and be deleted from the license as authorized places of use. By letters to the Region V Office dated July 28 and November 18, 1987; January 19, May 10, and December 21, 1988; and January 30, August 31, September 13, and October 17, 1989, GA requested that confirmatory surveys of the areas be conducted and the areas be released for unrestricted use. These requests were not accompanied by a license amendment request. By letter dated October 19, 1989, the NRC informed GA that they should request a license amendment to have these areas removed as authorized places of use, which GA complied with in the subject application. Oak Ridge Associated Universities (ORAU) conducted confirmatory surveys for some areas, and the NRC Region V Office conducted the confirmatory surveys for others. ORAU's findings are documented in reports issued in November 1988, July 1989, and January 1990. The Region's findings are documented in Inspection Reports 87-11 and 87-15. The criteria used for the buildings are contained in "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" (copy attached). The criteria for uranium in soil was 30 picocuries per gram.

Discussion

Building 9

GA submitted a report dated July 28, 1987, to the NRC and the State of California requesting the release of the Experimental Building (Building 9) to unrestricted use. This report included the former Pilot Plant area, where a portion of TRIGA Fuel Fabrication activities were conducted, but did not include the Hot Suite area. The Hot Suite area is discussed separately in this evaluation. The Region V Inspectors conducted a confirmatory survey of the Pilot Plant area on August 18, 1987. Their findings are documented in Inspection Report No. 70-734/87-11 which was forwarded to GA by letter dated October 1, 1987. The Region concluded that this portion of the Experimental Building had been satisfactorily decontaminated by the licensee and was acceptable for release to unrestricted use in accordance with NRC guidelines. Additionally, the State of California released the building to unrestricted use on May 14, 1987.

Decontamination of the portion of Building 9 referred to as the Hot Suite area has been pursued in three stages. On January 30, 1989, GA submitted its report on Stage 1. Stage 1 consisted of Rooms 34, 35, 38, 39, 47A, 48, 49A, 50, a hallway area east and south of room 47A, and a hallway area east of room 38. ORAU conducted the confirmatory survey for the Stage 1 area during March 14-23, 1989. ORAU found that final measurements indicated that all radiological conditions satisfied the established guidelines. By letter dated August 18, 1989, Region V informed GA of the ORAU findings. The ORAU final survey report dated July 1989 was designated NRC Inspection Report No. 70-734/89-02. By memorandum dated August 22, 1989, Region V recommended that this area be released for unrestricted use.

By letter dated August 31, 1989, GA submitted its report on Stage 2 of the Hot Suite Area. Stage 2 consisted of Rooms 40, 41, 42, 43, and 47. ORAU conducted a confirmatory survey of the Stage 2 area during October 9-12, 1989. ORAU's final report was issued January 1990. ORAU's findings show that the area meets the guidelines established for release to unrestricted use. By letter dated February 16, 1990, Region V informed GA of the ORAU findings. The ORAU final survey report was designated NRC Inspection Report No. 70-734/90-01. By memorandum dated February 16, 1990, Region V recommended that these facilities be released for unrestricted use.

Stage 3 of the Hot Suite area consists of Room 49. GA has not completed decontamination of this area.

Based on a review of the GA, Region V, and ORAU reports, the staff recommends that Building 9, except Room 49, be released for unrestricted use and be removed from GA's license as an authorized place of use.

Building 2

GA submitted to Region V a report dated November 18, 1987, requesting a confirmatory survey of several laboratories within Section B of the Science Laboratories Building (Building 2). On January 19, 1988, GA submitted a report on additional laboratories in Sections A, B, and C. (These labs were first requested to be included in the confirmatory survey by telecon December 10, 1987.) Section A Laboratories were rooms 641 and 643 and the mezzanines. Section B Laboratories consisted of Rooms 102, 104, 107, 109, 111, 113, 115, 117, 119, 122, 128, 130, 132, 134, 137, 139, 141, 143, 145, 147, 149, 151, and 154. Rooms 115, 117, 119, and 122 contain mezzanines. Section C consisted of two areas within the service corridor where GA had removed a contaminated floor drain, concrete, and soil from the service area behind Room 331 and Room 359/361. These labs and rooms have been designated as Group 1. Region V conducted the confirmatory survey for these areas on December 14-16, 1987. The State of California also performed a confirmatory survey. Region V documented their findings in Inspection Report No. 70-734/87-15 which was forwarded to GA by letter dated February 26, 1988. The Region concluded that the areas had been satisfactorily decontaminated and were acceptable for release to unrestricted use in accordance with NRC guidelines.

GA submitted to Region V a report dated May 10, 1988, requesting a confirmatory survey of the Group 2 areas in Building 2. Group 2 consisted of Rooms 228, 230, 232, and 236 of Section B and Rooms 311, 319, 331/333, 419/421 and 435/437 of Section C and the mezzanines above labs 331, 333, 419, 435, and 437. The mezzanine above lab 417 was surveyed and found to meet the criteria, however, since the lower lab may still contain some contamination, the mezzanine will not be deleted from the license. While performing a land survey on June 20-29, 1988, ORAU performed the confirmatory survey for Group 2. The survey identified several small areas of residual contamination which were remediated by GA and then resurveyed by ORAU. All final survey results were below the guidelines established for release for unrestricted use. The ORAU final survey was issued in November 1988.

By letter dated December 21, 1988, GA requested the release of 15 laboratories and 9 mezzanines within Building 2. These areas were designated as Group 3. Group 3 included Rooms 234, 321, 323, 327, 343, 345, 347, 425, 427, 429, 431, 433, 647, 649, and 651 and their mezzanines and the mezzanines above labs 325, 335, 337, 339, 341, 349, 615, 617, and 645. Labs 325, 335, 337, 339, 341, 349, 615, 617, and 645 do not contain radioactive material. By facsimile dated February 28, 1989, GA added to Group 3, Rooms 302, 315, and Rooms 1 and 2 in Laboratory 309 and presented preliminary findings. By letter dated October 17, 1989, GA submitted the final report (dated September 22, 1989) for these added areas. On March 12-14, 1989, ORAU conducted the confirmatory survey for Group 3. ORAU's final report was published July 1989. ORAU results indicate that the areas now meet the guidelines for release for unrestricted use. By letter dated August 18, 1989, Region V informed GA of the survey results. The ORAU report was designated as NRC Inspection Report No. 70-734/89-02. By memorandum dated August 22, 1989, Region V recommended that these areas be released for unrestricted use.

By letter dated September 13, 1989, GA submitted a request for a confirmatory survey for the Group 4 laboratories of Building 2. Group 4 consisted of labs 317, 335/357, 359/361, 554/556/558/560, and 562/564 and mezzanines above 317, 359, and 361. ORAU conducted a confirmatory survey October 9-12, 1989. The final report was issued January 1990. ORAU concludes that the area meets the established criteria and can be released for unrestricted use. By memorandum dated February 16, 1990, Region V recommended that these labs be released for unrestricted use.

One concern on releasing these labs was the possibility of cross contamination from normal building ventilation flows. However, the ventilation system utilizes single pass air; recycle air is not used. Each room exhausts separately to the environment. Cross contamination should not be a problem.

Many of the labs in Building 2 were never used for radioactive materials, some contained only sealed sources. There are currently 18 rooms that may contain radioactive material, some of these contain only sealed sources or require negligible cleanup. These labs are 351, 401, 403, 405, 407, 409, 411, 413, 415, 417, 439, 441, 443, 445, 506, 508, 523, 623, and 625. Additionally, eight labs were decontaminated in 1990 (Group 5 labs). No confirmatory survey has been scheduled for these labs.

Based on the review of the GA, ORAU, and Region V reports, the staff recommends that the labs, except the mezzanine above lab 477, in Groups 1, 2, 3, and 4 of Building 2 be released for unrestriced use and be removed from GA's license as authorized places of use.

On February 26, 1990, the State of California was contacted about the proposed action. The State requested a copy of the NRC final action and has been placed on the distribution list.

Copies of all GA and NRC correspondence and reports are attached.

Conclusion/Recommendation

The staff has evaluated GA's decontamination activities covering Buildings 2 and 9 and recommends that the areas discussed above be released for unrestricted use and thereby, be removed from the license as authorized places of use.

The Region V Principal Inspector has no objection to this proposed action.

Original Signed By:

Merri Horn
Uranium Fuel Section
Fuel Cycle Safety Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Approved by: Original Signed By:
George H. Bidinger, Section Leader

Attachments: Listed on page 5

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OFC:IMUF:	IMUF:	IMUF:
NAME:MHorn:mh:	VLTharpe:	GHBidinger:
DATE:12/5/90:	12/06/90:	11/6/90:

OFFICIAL RECORD COPY

ATTACHMENTS

Criteria

Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material.

GA Correspondence

July 28, 1987
November 18, 1987
January 19, 1988
May 10, 1988
December 21, 1988
January 30, 1989
February 28, 1989
August 31, 1989
September 13, 1989
October 17, 1989
November 17, 1989

ORAU Reports

November 1988
July 1989
January 1990

NRC Correspondence

October 1, 1987 - Inspection Report No. 70-734/87-11
February 26, 1988 - Inspection Report No. 70-734/87-15
August 18, 1989 - Inspection Report No. 70-734/89-02
August 22, 1989 - Memo GYuhas to LRouse
February 16, 1990 - Inspection Report No. 70-734/90-01
February 16, 1990 - Memo GYuhas to GSjoblom

CRITERIA

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE, OR SPECIAL NUCLEAR MATERIAL

U.S. Nuclear Regulatory Commission
Division of Industrial and
  Medical Nuclear Safety
Washington, DC 20555

August 1987

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GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT
PRIOR TO RELEASE FOR UNRESTRICTED USE
OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE,
OR SPECIAL NUCLEAR MATERIAL

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CRITERIA

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer of premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

    a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

    b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Industrial and Medical Nuclear Safety, U. S. Nuclear Regulatory Commission, Washington, DC 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

   a. Identify the premises.

   b. Show that reasonable effort has been made to eliminate residual contamination.

   c. Describe the scope of the survey and general procedures followed.

   d. State the findings of the survey in units specified in the instruction.

   Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES[a]	AVERAGE[b][c][f]	MAXIMUM[b][d][f]	REMOVABLE[b][e][f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

GA CORRESPONDENCE

GA Technologies

GA Technologies Inc.
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SAN DIEGO, CALIFORNIA 92138
(619) 455-3000

July 28, 1987
CAL-1095

Mr. Ben Kapel
Health Physicist
Radioactive Material Licensing
Radiologic Health Branch
Department of Health Services
714/744 P Street
Sacramento, CA 95814

Subject: Radioactive Materials License No. 0145-80; Final Survey Report on the Decontamination of GA Technologies' Experimental Building

References:

1. Asmussen, Keith E., letter CAL-1049 to Mr. Ben Kapel, "Decontamination of GA Technologies' Experimental Building," dated March 27, 1987.
2. Kapel, Ben R., letter to Keith E. Asmussen dated May 14, 1987, Docket #033087-0145, containing Amendment #86 to GA's Radioactive Material License Number 0145-80.

Dear Mr. Kapel:

GA Technologies Inc. (GA) has recently completed its efforts to decontaminate its Experimental Building (Bldg. 9) and requests your department to conduct an independent survey to confirm that the building meets the criteria for release to unrestricted use. These criteria are the Department of Health Service's guidelines for decontamination of facilities and equipment (i.e., DECON-1) and the NRC-approved criteria for the release of soil as are described in Reference 1. The criteria for release of soil were approved by the Department of Health Services on May 14, 1987 (Reference 2).

To assist you in planning for the confirmatory survey and the subsequent release of the facility for unrestricted use, the following is provided in the enclosed report: 1) a summary of the initial contamination levels, by radionuclide, found prior to our decontamination efforts; and 2) results of surveys conducted after the affected portions of the facility were decontaminated.

I would like once again to call your attention to the urgency in getting this building released as expeditiously as possible. Due to the extensive decontamination efforts we have made in order to assure that the building meets the target criteria for release, several projects (some GA, some non-GA) currently in progress in the building have experienced significant interference, interruptions, and delays. They will continue to be inconvenienced and, in some cases, denied the use of their leased space until we obtain your approval to refurbish, and the building is released to unrestricted use. Furthermore, this effort is supported in part by the Department of Energy, which is concerned about an expeditious completion.

Thank you for your cooperation and responsiveness during our telephone conversations regarding the scheduling of the confirmatory survey. If you should have any questions regarding our request or the enclosed report, please contact me at (619) 455-2823 or Laura Quintana at (619) 455-2758.

By copy of this letter and report, we are also informing NRC Region V of the status of our efforts.

Very truly yours,

Keith E. Asmussen

Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

KEA/mk
Enclosures: Decontamination of the Experimental Building for
Release to Unrestricted Use - Final Report (2 copies)
cc: Mr. James Montgomery, U.S. NRC, Region V

DECONTAMINATION OF THE EXPERIMENTAL BUILDING
FOR RELEASE TO UNRESTRICTED USE

FINAL REPORT

JULY 28, 1987

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INTRODUCTION

In October 1986, GA Technologies Inc. (GA) initiated decontamination of the Experimental Building. GA has no plans for conducting any future activities involving radioactive materials in the "Experimental Building," or "E Building." (The E Building is also known as "Building 9" under the current building identification system.) Accordingly, GA has decontaminated the building for release to unrestricted use. The major contaminant found was thorium. The other observed contaminant was depleted uranium. This is consistent with past use of the building. Only about 10% of the building required decontamination.

GA has decontaminated equipment and facilities consistent with the guidelines incorporated into our Radioactive Materials License No. 0145-80, item 13([illegible]). These guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," are also known as "DECON-1."

In the process of decontaminating the E Building, concrete was removed in localized areas to the point of exposing the underlying soil. In those cases where the exposed soil was contaminated, soil was removed until the residual met the criteria approved by the U. S. Nuclear Regulatory Commission (NRC) and endorsed by the Department of Health Services for application at GA's site. These criteria for releasing soil to unrestricted use are summarized in Tables 2 and 3 of Reference 1. Soil samples were taken in every exposed location after clean-up in order to demonstrate compliance with the soil criteria. The results of the analyses of these samples and the results of the final surveys are included in this report to demonstrate compliance.

SITE DESCRIPTION

The location of the building with respect to other facilities on the GA Site is shown in Figure 1. A layout of the building is shown in

Figure 2. The entire building, including second floors and mezzanines is almost 60,000 ft^2, however, only a portion (about 20,000 ft^2) of the building was ever used for work involving radioactive material. Of this area only about a 5400 ft^2 and about 712 linear feet of concrete trenches required decontamination; this represents less than 10% of the entire building.

The building is currently being used for projects which do not involve the use of radioactive materials. A portion of the building is being leased to Ogden Environmental Services Inc.

HISTORICAL OVERVIEW OF PROCESSING ACTIVITIES

Until about 11 years ago, TRIGA fuel fabrication operations involving enriched uranium were conducted in a portion of this building. Since then, there have been no activities in the building involving quantities of enriched uranium in excess of that allowed under our state license (i.e. 350 gm U-235). In fact, during the past approximately 11 years, the quantity of U-235 in the E Building has been limited to 15 gm, except for one approximately four-month period in 1983 when about 191 gm U-235 were processed in the building.

HTGR fuel treatment methodology studies and demonstrations were performed in the Experimental Building from about 1971 until 1985 under the Consolidated Fuel Reprocessing Program (CFRP) and predecessor programs. In this extensive program, all phases of HTGR fuel treatment were studied and/or demonstrated including: a) fuel handling, storage, shipping and transportation, b) fuel crushing, c) fuel burning, d) burner ash dissolution, e) dissolver product feed adjustment, f) solvent extraction, and f) off-gas treatment. All studies were performed "cold", i.e., no enriched or irradiated nuclear fuel was used. The only significant quantities of nuclear materials used in the studies were depleted uranium (U-238) and natural thorium. Very small quantities (generally < 10 mCi) of short-lived radioactive tracers, e.g., I-131 and Zr-95, were used infrequently to gain process performance information as necessary. These short-lived radionuclides have not been used over the past five (5) years.

There were no areas which were exclusively contaminated with U-235. Thorium and depleted uranium were the dominant contaminants in every area with only small amounts of U-235 detected.

TARGET CRITERIA FOR UNRESTRICTED RELEASE

The following target criteria have been taken from Reference 1.

FACILITY AND EQUIPMENT

GA has decontaminated the building below the limits specified in Table 1. Equipment which was above these limits was packaged and disposed of as radioactive material. Table 1 is taken from the guidelines incorporated into our Radioactive Material License No. 0145-80, item 13 (a). These guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," are also known as "DECON-1".

SOIL CRITERIA

The criteria for soil decontamination is given in Tables 2 and 3. These criteria have been previously approved by the NRC for use at the GA site and were approved by the Department of Health Services in Reference 2. Table 3 provides soil concentrations in pCi/g which if residing on the surface and inhaled would not lead to an exposure exceeding the target criteria in Table 2.

Soil exposed after the removal of concrete in localized areas was analyzed by gamma spectroscopy to determine the radioactive concentrations of the various isotopes. If the levels were above the soil criteria summarized in Table 3, soil was removed until these levels were met.

PERSONNEL PROTECTION

Protective Clothing

During the removal and stockpiling of contaminated equipment, concrete, soil and other items, all personnel were kept out of the dust generated to every extent possible. Coveralls, gloves and shoe covers and dust masks were worn during the decontamination efforts.

Personnel monitoring

All personnel were assigned appropriate personnel monitoring devices, although the exposure in the area was almost always less than 0.5 mR/hr.

Air Sampling

Air samples were collected during all phases of the operations. Results of these air samples show concentrations were close to background levels.

Personnel Monitoring

All personnel involved in the decontamination effort surveyed themselves prior to breaks, lunch break and before leaving the area at the end of each work day. Personnel were given thorium lung counts at the end of the project. The results of these lung counts showed very low (if any) thorium lung burden.

RADIATION DETECTION EQUIPMENT

The following radiation detection equipment was used for the various surveys and analysis of soil samples.

1. Beta/gamma counters
   - a. Model TBM 28 geiger counters manufactured by Technical Associates were used to survey surfaces for beta/gamma contamination. The instruments contain a pancake geiger mueller (GM) detector which has a window thickness of less than 7 mg/cm^2. The instrument has three ranges covering from 0-50,000 counts per minute (cpm).
   - b. Model 3 ratemeter with a model HP-210 tungstun shielded pancake GM detector manufactured by Ludlum Measurements, Inc. The instrument has three scales covering from 0-400,000 cpm.

2. Alpha counters
   - a. Model 12 rate meters with Model 43-44 air proportional alpha probes manufactured by Ludlum Measurements Inc. were used to survey equipment and surfaces for alpha contamination. The instrument has four ranges covering from 0-500,000 counts per minute.

3. Gamma Detectors
   - a. The model 16 analyzer with a NaI scintillation detector manufactured by Ludlum Measurements Inc. was used primarily in the localized areas where soil was reached after the removal of concrete.
   - b. Gamma spectral analyses on selected samples of concrete and soil samples were done using a high purity germanium detector manufactured by Canberra Industries, Inc.

4. Wipe and Air Sample Analysis

   Wipe and air samples collected throughout the facility during and after clean-up operations were counted using two (2) Model 2404 low-level alpha beta gamma counting systems manufactured by Canberra Industries, Inc.

All portable instruments are calibrated semi-annually using a nominal 30 curie Cs-137 source. The alpha/beta systems and the germanium detector systems have been calibrated for the various type of samples. This calibration is checked on a daily or weekly basis depending on usage.

The final survey results have been converted from cpm (counts per minute) for a particular detector to dpm/100cm^2 by correcting the counts per minute observed by an appropriate detector readings for background, detector efficiency and geometric factors associated with the instrumentation.

1. Background

   A "standard" natural backgound was determined for each type of detector and subtracted from the survey readings.

2. Efficiency

   Portable beta/gamma (GM) and alpha counters were calibrated to determine their efficiencies for the radionuclides present in the E Building. Gamma scans of representative samples of contaminated concrete and soil samples from various parts of the building showed that natural thorium and depleted uranium were the predominant radionuclides.

   In order to simulate the conditions on the concrete surfaces, concrete blocks having an area of approximately 25 cm x 25 cm were each spiked with NBS tracable standard liquid solutions of natural thorium and depleted uranium to the average allowable release levels listed in Table 1. These average allowable levels are 1000 dpm/100 cm^2 for thorium and 5000 dpm/100 cm^2 for depleted uranium, averaged over a 1M^2 area. The maximum allowable levels are 3000 dpm/100 cm^2 and 15,000 dpm/100 cm^2 for thorium and depleted uranium, respectively. Surface measurements of the blocks were then taken with the instruments and the readings were recorded. Percent efficiencies were obtained. The readings were corrected for efficiency by multiplying by a correction factor which varied for each instrument. These factors are provided below for both thorium and depleted uranium.

3. Geometry Correction
The values listed in Table 1 are in dpm/100 cm^2, therefore, a correction factor was applied to the values to correct for the smaller area of the detector. The TBM-28 has a 5 cm diameter detector which measures a 19.6 cm^2 area. The reading is corrected by multipliying by 5.1. The alpha detectors used for the surveys "see", at any given time, an area of about 78.7 cm^2, which then requires a correction factor of 1.27.

Instrument data for Natural Thorium

Manufacturer	TA	TA	Ludlum	Ludlum	Ludlum
Detector Model #	TBM 28	TBM 28	HP-210	43-44	43-44
ID #	#9660	#2759	#91514	#46452	#46465
Gross CPM Reading on Standard Source	110	100	70	40	30
Background CPM	60	60	40	0	0
Net CPM	50	40	30	40	30
Percent Efficiency	26.6%	21.3%	15.9%	5.3%	4.0%
Efficiency Correction Factor	x3.76	x4.69	x6.29	x18.87	x25
Geometry Correction Factor	x5.1	x5.1	x5.1	x1.27	x1.27
Conversion Factor	x19.18	x23.92	x32.1	x23.96	x31.75

Instrument data for depleted uranium

Manufacturer	TA	TA	Ludlum 3	Ludlum 12	Ludlum 12
Model #	TBM 28	TBM 28	HP-210	43-44	43-44
ID #	#9660	#2759	#91514	#46452	#46465
Gross CPM Reading on Standard Source	320	300	280	110	80
Background CPM	60	60	70	0	0
Net CPM	260	240	210	110	80
Percent Efficiency	26.5	24.5	21.4	2.8	2.0
Efficiency Factor	x3.77	x4.08	x4.67	x35.71	x50
Geometry Correction Factor	x5.1	x5.1	x5.1	x1.27	x1.27
Conversion Factor	19.22	20.81	23.82	45.52	63.50

MEASUREMENT LIMITS FOR RELEASE

A gamma spectral analysis on a composite sample of contaminated concrete from various areas including the trenches showed an average of 60% thorium and 40% depleted uranium.

Since there was a combination of thorium and depleted uranium in the contaminated areas, a combination limit of these radionuclides was used. In order to be conservative, a limit assuming 70% thorium and 30% depleted uranium was used. Applying this to the Table 1 limits and converting the values to cpm for the instruments used gives the following limits for release to unrestricted use.

Average = (0.7)x(1000) + (0.3)x(5000) = 2200 dpm/100 cm^2
Maximum = (0.7)x(3000) + (0.3)x(15000)= 6600 dpm/100 cm^2

Manufacturer	TA	TA	Ludlum	Ludlum	Ludlum
Detector Model #	TBM 28	TBM 28	HP-210	43-44	43-44
ID #	#9660	#2759	#91514	#46452	#46465
Average Allowable Net CPM	114	100	85	61	48
Maximum Allowable Net CPM	343	304	254	186	137

DECONTAMINATION OF THE BUILDING

AREA DECONTAMINATED

The entire E building is about 59,648 ft^2 (see Figure 2). The pilot plant area of the building consists of about 19,648 ft^2 of main floor area and about 4000 ft^2 of second floor mezzanine. A third floor mezzanine area of about 600 ft^2 area was completely removed during the decontamination activities; only a small area (about 112 ft^2) of the third floor remains. A total of about 5400 ft^2 was decontaminated as well as 712 linear feet of concrete trenches.

REMOVAL OF RADIOACTIVE MATERIAL AND EQUIPMENT

All radioactive material was removed from the building and either disposed of as radioactive waste or shipped to a facility licensed to receive it.

All equipment was monitored by Health Physics before removal from the area. If the equipment showed any measureable beta/gamma or alpha contamination it was disposed of as radioactive waste. If no measureable contamination was detected, a label marked "clean" was attached to the equipment prior to being removed from the area, unless the item was very small or the items were pieces of wires, etc. A total of 56 boxes representing 7500 cubic feet of radioactively contaminated equipment was generated. Occasionally, an item was decontaminated rather than disposed of as waste.

INITIAL SURVEY

An initial survey was conducted after the removal of all equipment associated with the use of radioactive material to determine the extent of the remaining contamination and the radionuclides present. Samples of contaminated concrete from the floor areas and trenches were collected and gamma scanned. The samples showed both thorium and depleted uranium and some U-235. No other radionuclides were detected. A composite of these samples was analyzed and showed about 59.4% thorium, 39.4% depleted uranium and 0.8% of U-235. A beta/gamma survey of the area was conducted on the floors and trenches of the main floor and the second floor mezzanine. These survey results are shown in Figure 3. An initial survey of the second and third floor areas is shown in Figure 4. All values are provided in cpm (beta/gamma contamination) using a Technical Associates Model TBM-28 GM detector. All areas requiring decontamination were cleaned until they were below the release criteria.

DECONTAMINATION METHODS

Every resonable effort was made to eliminate residual contamination. No covering was applied to the contaminated surfaces of equipment or structures such as paint, plating or other means. All underground drainlines, pipes or duct work previously used for radioactive work were completely removed.

Third Floor Mezzanine

The third mezzanine floor (about 600 ft^2) which had been directly over the solvent extraction area was removed completely. The equipment and metal platform were disposed of as radioactive waste if any contamination was detected. The only third floor area remaining is a 112 ft^2 area which did not require decontamination.

Second Floor Mezzanine

About 2000 of the 4000 ft^2 area of the second floor mezzanine required cleaning. Some small sections of the metal decking were cut out with a torch and new metal decking installed when the metal could not be cleaned.

Main Floor Area

The main floor area on the southeast side of the "Pilot Plant" area required the most decontamination effort. The "leach room" walls were removed. Tile from the "leach room" and other areas was contaminated and disposed of as "hot" waste. The concrete underneath the "leach room" was also contaminated as was portions of concrete from other parts of the building including selected portions of some walls. Whe surface cleaning did not reduce the contamination to the acceptable levels, the concrete surface was scabbled using jackhammers, or the concrete was completely removed. All surfaces were then checked with a calibrated instrument for both beta/gamma contamination and alpha contamination. The decontamination effort was continued if the levels were still above the limits specified in Table 1. Most of the solvent extraction area required scabbling of the concrete as did a large number of the concrete trenches and the "leach room". A significant portion of our effort involved the decontamination of these concrete "trenches" in the floor of the building. These trenches typically contained electrical conduits, pipes, etc. They are usually covered with steel plates or grating which thereby forms a part of the floor surface. Some trenches extend across ailes and walkways; others extend through laboratories, control rooms, and other work areas where projects are currently in progress. Further, some of these areas have been leased to another company which has projects in progress.

Figure 5 shows the various decontamination efforts done at the E Building. All the trenches in the building were checked. Some of these trenches had been filled with sand and gravel and a layer of cement about 10 years ago. All the trenches (filled and unfilled) were checked.

The areas in blue in Figure 5 show some of the areas where surface concrete and the underneath sand and gravel were removed from the "filled" concrete trenches so they could be surveyed. These surveys revealed that these trenches were clean. Most of these trenches were once again filled back in because they were disrupting project activities i.e. the computer room and the women's change room.

The areas in green in Figure 5 show the trenches and concrete floor where decontamination was completed by washing or steam cleaning the area or trench.

Concrete surfaces and trenches shown in yellow in Figure 5 required that the concrete be scabbled to remove the surface contamination. In order to decontaminate these areas, GA had to disrupt other projects while the decontamination work was performed. To minimize the impact of this disruption on the other GA and non-GA projects, we minimized the duration and scheduled the work in cooperation with the other occupants of the building.

As we discussed in Reference 1, some reconstruction essential to the return of the area/interrupted project to service was required. Similarly, reconstruction was permitted in those instances where safety or structural integrity of the building was jeopardized by not reconstructing as soon as practical. The areas which were reconstructed were the old hot sink location and trench to the drain line, a portion of the chemistry lab, locations immediately around the posts and the trench in the control room. These portions of the building are all shown in Figure 5 in pink. These refurbished areas were limited to a total of 20% of the total area decontaminated to allow the Department of Health Services at least 80% of the area available for a confirmatory survey. A documented survey of each of these areas was conducted prior to refurbishment and are discussed in the section on "Final Radiation Surveys".

Those localized areas where concrete was removed to the point of exposing the underlying soil are shown in brown in Figure 5.

Estimated Area of Decontamination and Reconstruction (See Figure 4)

				% of total area	% of total scabbled area
CLEANED (Green)					
	Floor	1,024	feet square		
	Trenches	208	linear feet		
	Second Deck	1,920	feet square		
SCABBLED (Yellow)					
	Floor	1,280	feet square		
	Trenches	432	linear feet		
	Walls	512	feet square		
RECONSTRUCTED (pink)					
	Floor	64	feet square	3 %	12.5%
	Trenches	72	linear feet	11.25%	16.6%

Data derived from DWGL1B, 1"=16'; trench dimensions -bottom width is 1.5 feet, sides of trench are 1 foot high.

Portions of the concrete from the east and south walls of the pilot plant area were also removed during clean-up and disposed of as radioactive waste. In all, about 512 ft^2 of surface concrete on the wall surfaces was removed. The walls were cleaned to levels below Table 1 limits.

FINAL RADIATION SURVEYS

Final surveys of the areas which were cleaned and/or scabbled were conducted. The measurements of average contamination were averaged over 1 M^2. The maximum contamination level applies to an area of not more than 100 cm^2.

Several final surveys were conducted after clean-up. Surveys of the refurbished areas were obtained prior to refurbishment. The results are shown in Figures 6 and 7. Figure 6 shows the results of the control room trench and the small area in the Ogden burner pit which have been covered, at least partially, with concrete. The results demonstrate compliance with Table 1 limits. Figure 7 shows the old "hot sink" area, the trench from the hot sink to the floor drain and the floor drain area as well as the chemical preparation room and solvent extraction area. Radiation levels on the concrete surfaces are given in dpm/100 cm^2, both for the average and the maximum in a 1 M^2 area. Radiation levels in the areas where soil was reached are provided in cpm rather than dpm because in these areas compliance is demonstrated by using soil sample results rather than instrument readings. The collection, preparation, analysis and results of these soil samples are as follows:

> Surface soil samples were collected at each area where soil was exposed. The soil samples were dried to remove moisture. The samples were crushed and mixed to eliminate clumping and to homogenize the sample. The soil samples were then analyzed by gamma ray spectroscopy using a high purity germanium detector system in accordance with written procedures. All gamma emitting radionuclides were identified and their concentrations were determined. The Th-232 value was obtained based on the concentrations of the daughter radionuclides. Th-232 was assumed to be in equilibrium with its daughters.

In a total of fifteen (15) localized areas, concrete was removed to the point of exposing the underlying soil. The locations of these areas are provided in Figure 13. In several of these areas, contaminated soil was removed. In every area, soil samples were collected to determine the extent of contamination. Table 4 provides the results of the these initial soil samples taken prior to clean-up. A few of these areas had soil contaminated to levels which exceeded the release criteria described in Tables 2 and 3. In these cases, soil was removed until the approved levels were met. In all cases, the concentrations of contamination in the soil were reduced by the removal of the top soil. Table 5 provides the final results of soil samples taken after clean-up. No additional soil samples were collected in those areas where the initial soil sample result did not exceed the soil release criteria. All these results meet the criteria for release to unrestricted use.

The final survey for the main floor area is provided in Figure 8. The only areas which were not surveyed were the concrete surfaces beneath the blower assembly, the lockers and the permanent cabinets all shown in Figure 8. In each of these cases the equipment would have had to be removed. This was not necessary because is no reason to believe that the concrete was contaminated. None of the areas immediately around the equipment required decontamination.

The results of the surveys of the second and third floor mezzanines are shown in Figure 9 (excluding some of the refurbished areas which are covered in Figures 6 and 7).

A final meter survey of the east and south walls of the southeast side of the building is given in Figure 10. These were the only walls of the building which required decontamination.

FINAL CONTAMINATION SURVEYS

Table 1 provides limits for acceptable removable surface contamination levels. Although the type of decontamination efforts (i.e. washing, scabbling and vacuuming) conducted throughout the E Building eliminates the probability of removable contamination, a detailed large area wipe survey was conducted. These large area wipes were collected on floors, walls, ducts, pipes and ceiling structures. The main floor wipe sample locations are shown in Figure 11. The second level wipe sample locations are shown in Figure 12. The results are shown in Table 6. Wipes of the concrete from small areas around the posts of the solvent extraction areea were also collected and analyzed. These posts hold up the second floor mezzanine so it was necessary to pour concrete around a few of them as soon as possible. The wipe locations and results are shown in Table 5. Both the contamination and radiation levels were below the Table 1 limits.

A contamination survey of random pipes, beams, ducts and roof was also conducted. The results are given in Table 8.
The contamination levels in every area were < 20 dpm/100 cm^2 area, and well below the Table 1 limits for removable contamination.

RADIOACTIVE WASTE SUMMARY

56 boxes of contaminated equipment	7500 cubic feet
165 55-gallon drums of radioactive material and contaminated trash	1238 cubic feet
91 55-gallon drums of concrete	682 cubic feet
12 55-gallon drums of soil	90 cubic feet
10 55-gallon drums of asphalt	75 cubic feet
TOTAL	9585 cubic feet

COMPLIANCE WITH THE TARGET CRITERIA

Facilities and Equipment

Equipment, concrete and other surfaces of the building were cleaned to levels below the limits in Table 1. The final surveys provided in this report demonstrate compliance.

Direct Radiation

The direct radiation level at all areas of the building is less than 10 microR/hr above background (at one meter above ground level).

Soil Limits

The results of soil samples collected in every area where soil was reached during the clean-up of the concrete were well below the levels specified in Table 2 and 3.

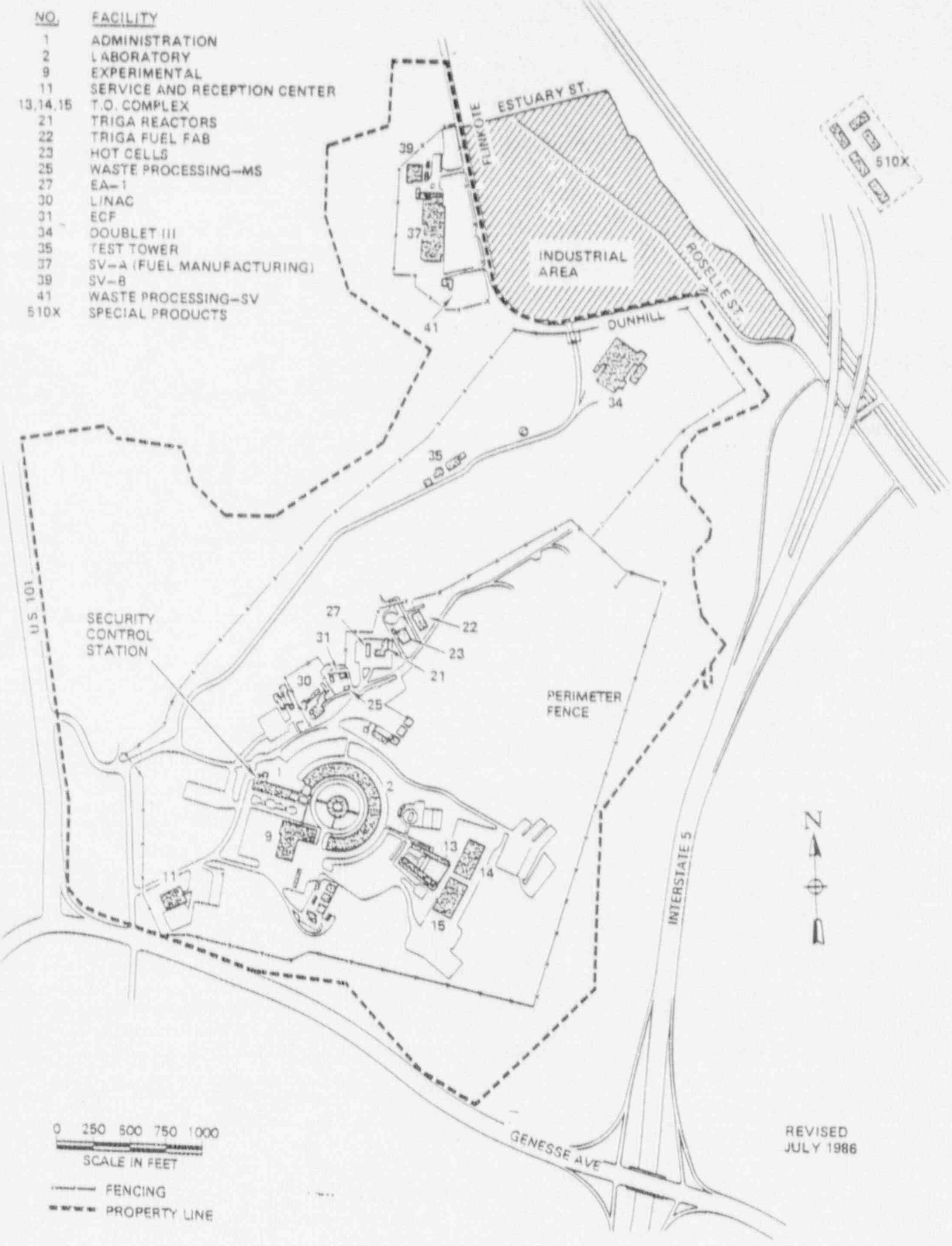
CONCLUSION

The Experimental Building has been decontaminated to levels below the specified limits and therefore meets the criteria for release to unrestricted use.

REFERENCES

1. Asmussen, Keith E., letter #CAL-1049 to Mr. Ben Kapel, "Decontamination of GA Technologies' Experimental Building," dated March 27, 1987.

2. Kapel, Ben R., letter to Keith E. Asmussen dated May 14, 1987. Docket #033087-0145, containing amendment #86 to GA's radioactive material license number 0145-80.



NO.	FACILITY
1	ADMINISTRATION
2	LABORATORY
9	EXPERIMENTAL
11	SERVICE AND RECEPTION CENTER
13,14,15	T.O. COMPLEX
21	TRIGA REACTORS
22	TRIGA FUEL FAB
23	HOT CELLS
25	WASTE PROCESSING—MS
27	EA—1
30	LINAC
31	ECF
34	DOUBLET III
35	TEST TOWER
37	SV—A (FUEL MANUFACTURING)
39	SV—B
41	WASTE PROCESSING—SV
510X	SPECIAL PRODUCTS

FIGURE 1: PLAN VIEW OF SITE

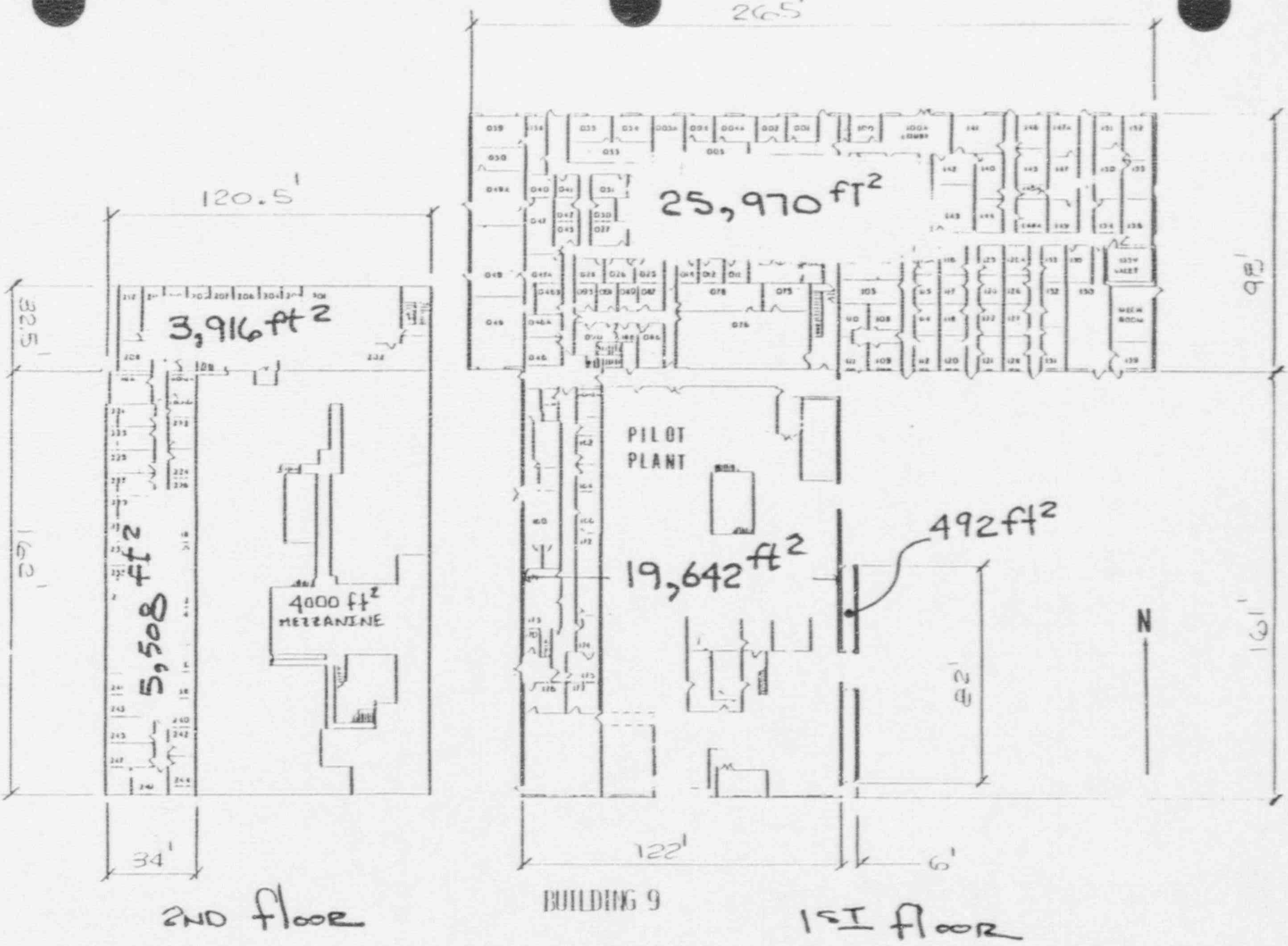
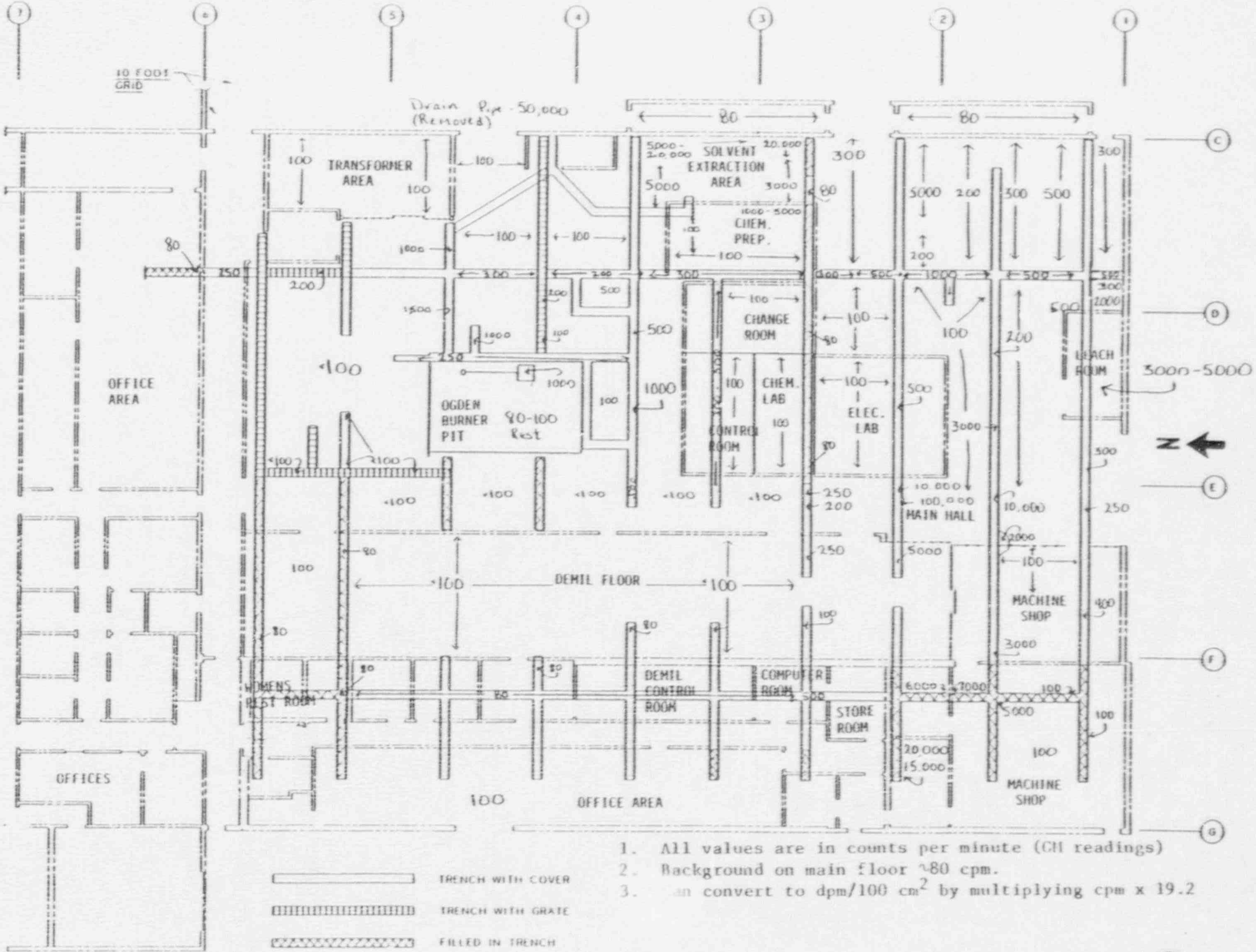
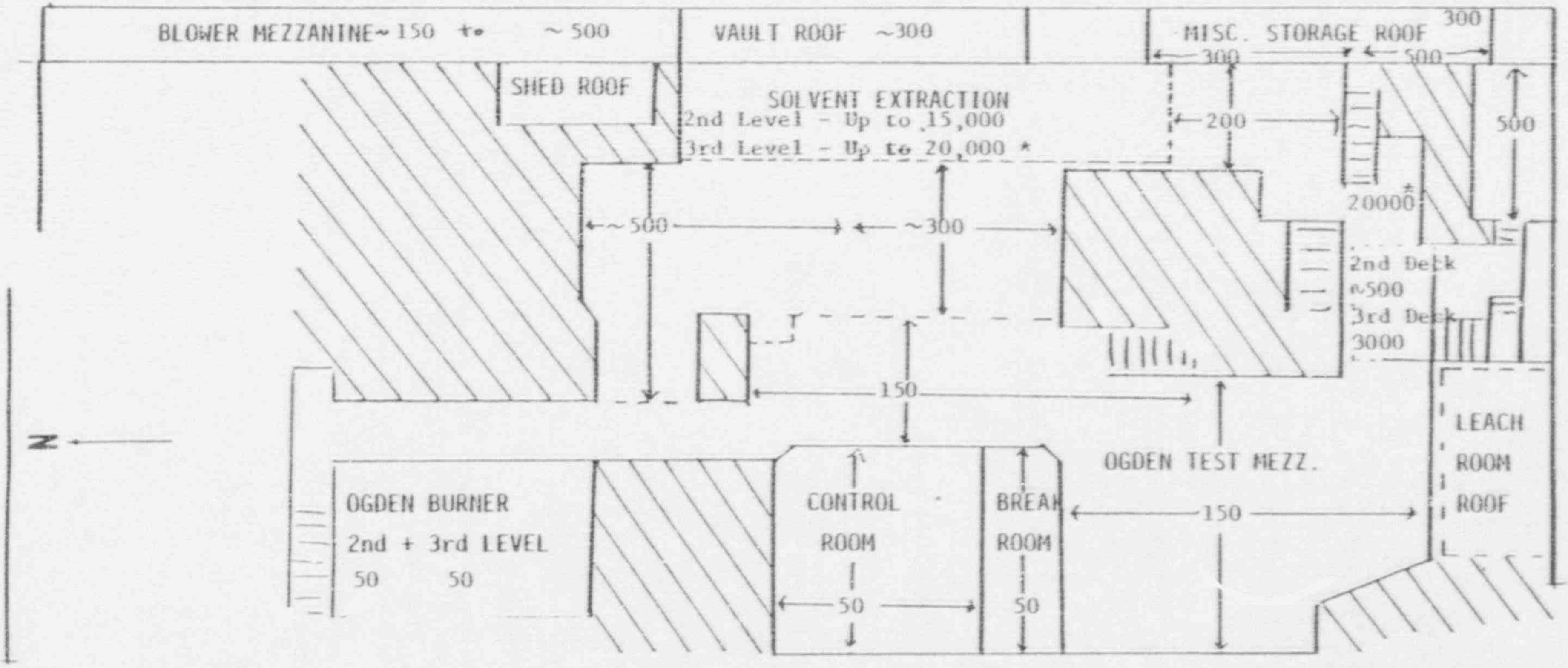


FIGURE 2: EXPERIMENTAL BUILDING



1. All values are in counts per minute (GM readings)
2. Background on main floor ~80 cpm.
3. Can convert to dpm/100 cm^2 by multiplying cpm x 19.2

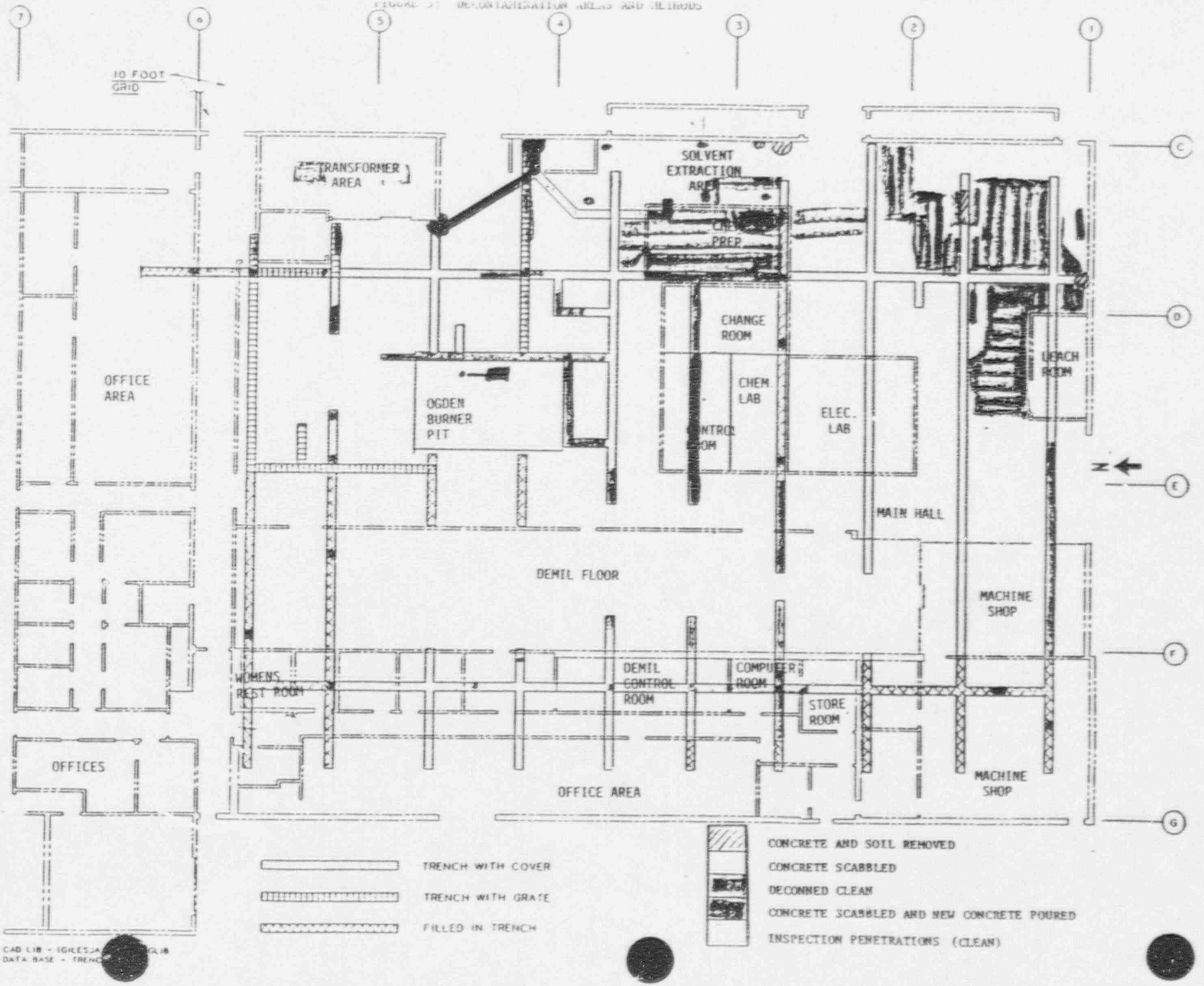
FIGURE 3: INITIAL SURV[illegible] MAIN FLOOR AREA



1. All values are in counts per minute (Gm readings)
2. Background in second and third floor - ~50 cpm
3. Can convert to dpm/100 cm^2 by multiplying cpm x 19.2
4. Values with * are readings on third floor mezzanines which were removed during clean-up and disposed of to "hot" waste.

FIGURE 4: INITIAL SURVEY - SECOND AND THIRD FLOOR MEZZANINES

FIGURE 5: DECONTAMINATION AREAS AND METHODS



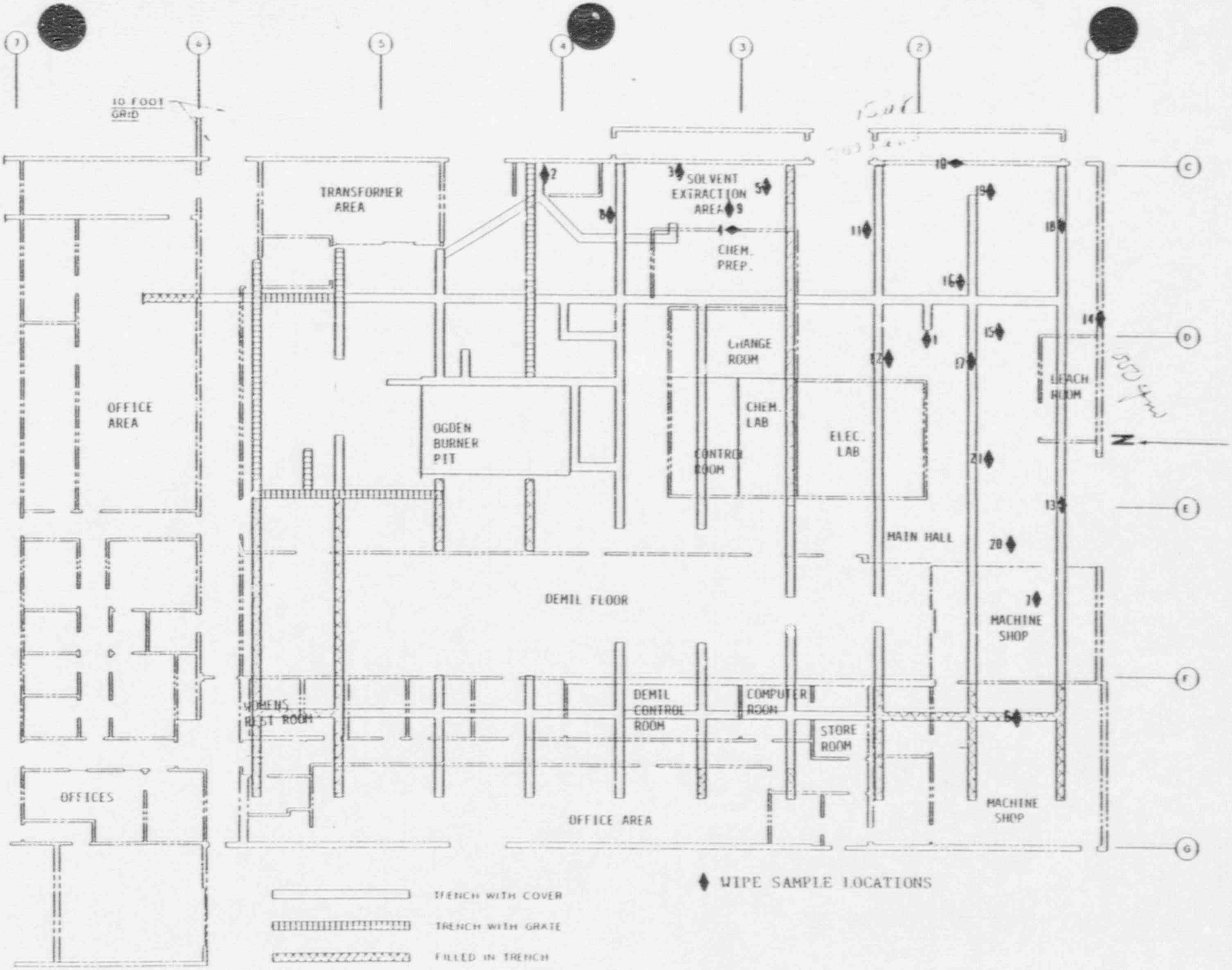
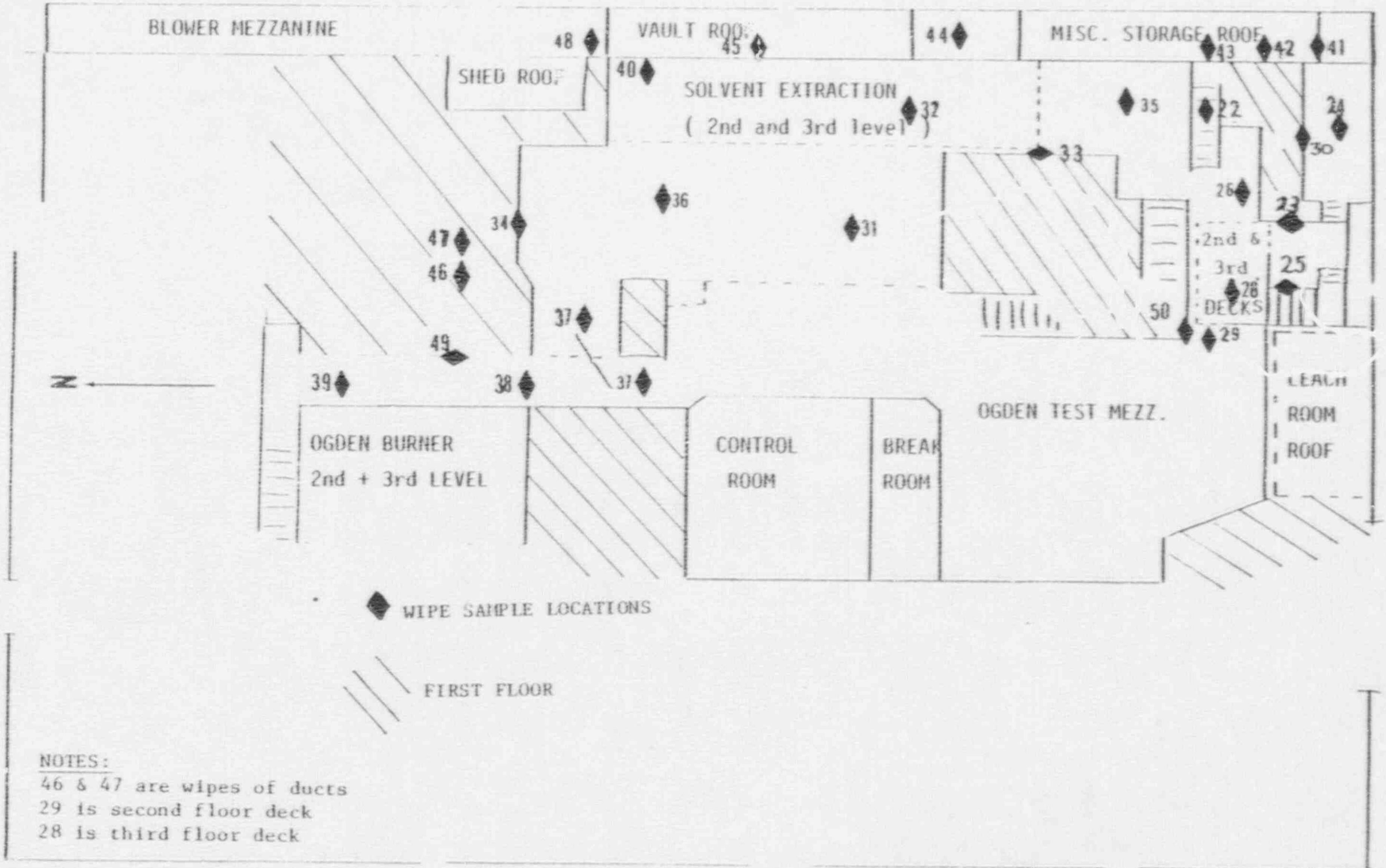


FIGURE 6: CONTAMINATION SURVEY LOCATIONS - MAIN FLOOR



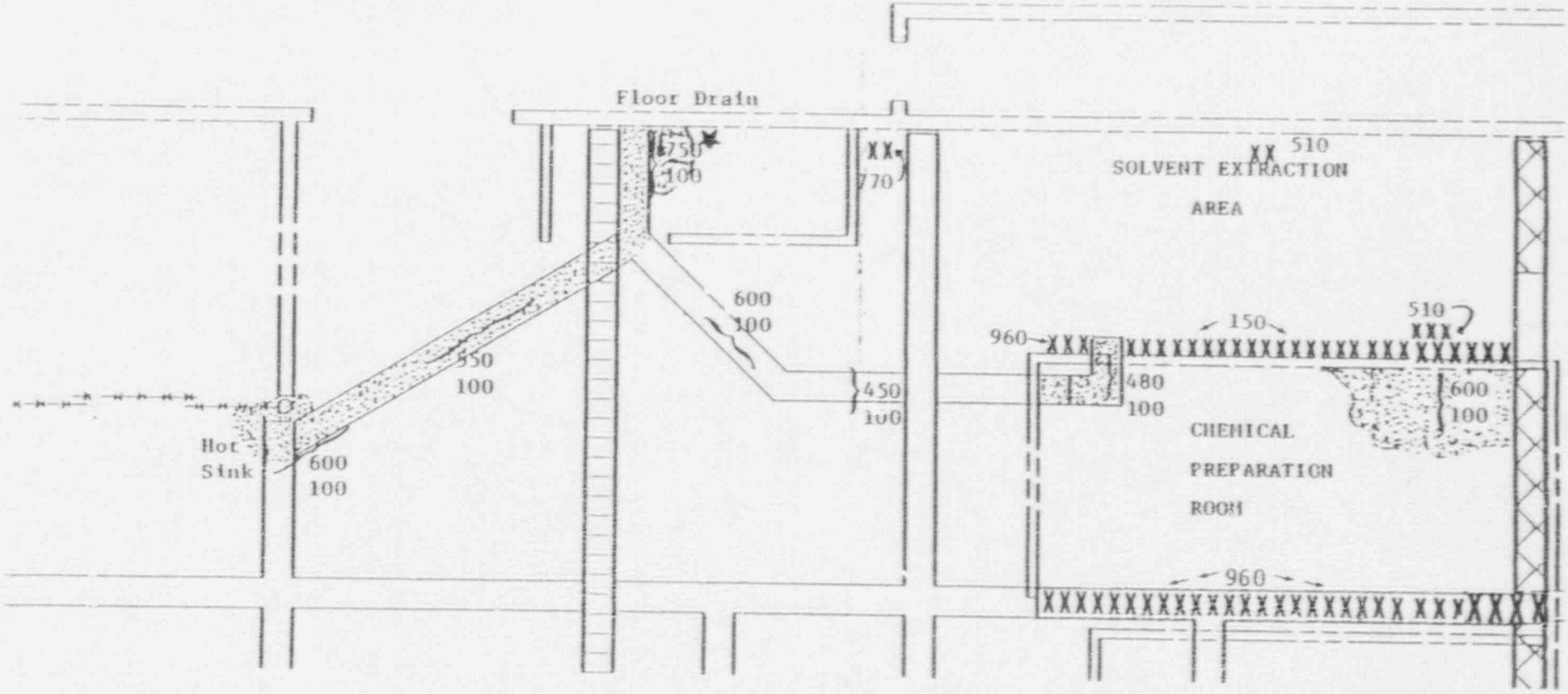
NOTES:
46 & 47 are wipes of ducts
29 is second floor deck
28 is third floor deck

SECOND & THIRD FLOOR MEZZANINES

FIGURE 7: CONTAMINATION SURVEY LOCATIONS

FIGURE 8: SURVEY OF DRAIN LINE ARE[illegible] - CHEM PREP ROOM - SOLVENT EXTRACTION AREA

PRIOR TO REFURBISHMENT



✶ Top Value - Reading obtained using a NaI scintillation detector #16249. Background was 400 CPM N ←

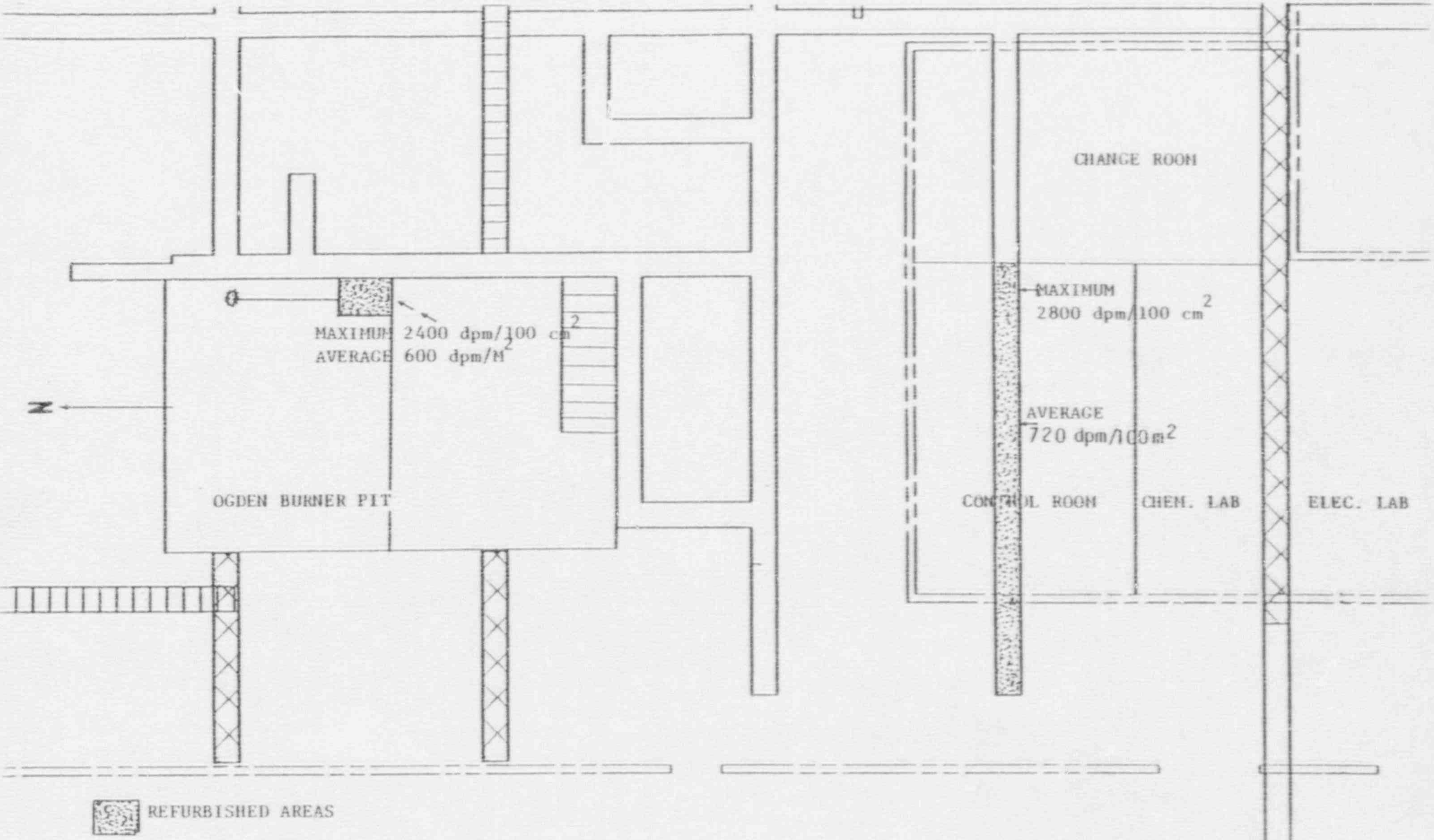
Bottom Value - Reading obtained using a geiger counter TBM-28 #2759. Background was 80 CPM

Surveyed 3-12-87 by S. Perelman

▨ Refurbished Areas - Concrete was removed in these areas and soil samples were collected and analyzed. Results demonstrate compliance (see Figure 13 & Table 5).

XXX Refurbished Areas - Concrete was scabbled in these areas and a survey conducted on 2-19-87 by S. Perelman (TBM-28 #9660) results converted to dpm/100 cm^2 and the highest values for the area are provided.

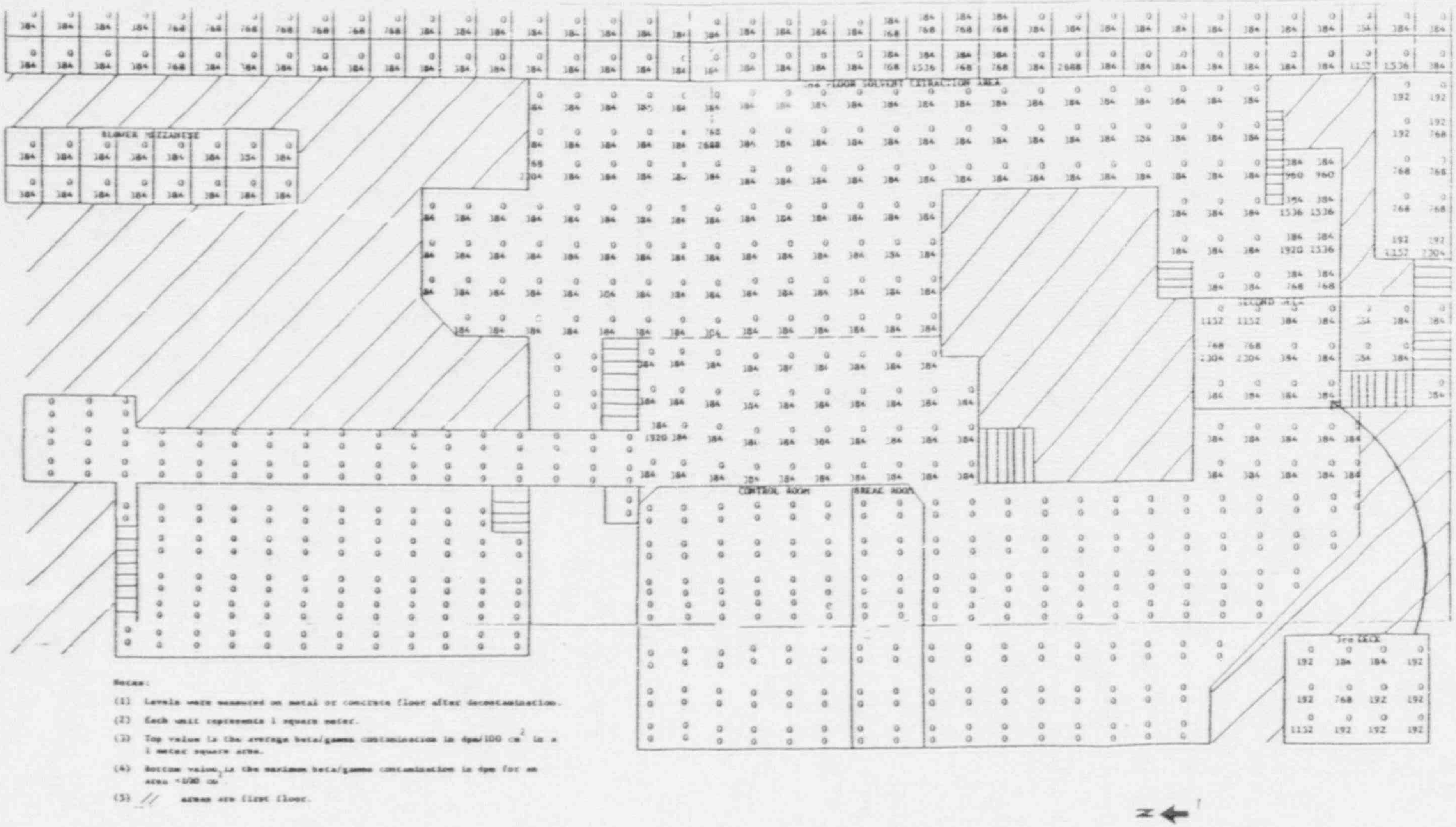
FIGURE 9: SURVEY OF CONTROL ROOM AND OGDEN PIT AREA PRIOR TO REFURBISHMENT



CONTROL ROOM SURVEYED 3-25-87 BY K. THOMPSON; TBH 28 #2759

PIT[illegible]A SURVEYED 3-24-87 BY K. THOMPSON; TBH 28 #2759

FIGURE 10: FINAL SURVEY - MAIN FLOOR



Notes:

(1) Levels were measured on metal or concrete floor after decontamination.

(2) Each unit represents 1 square meter.

(3) Top value is the average beta/gamma contamination in dpm/100 cm^2 in a 1 meter square area.

(4) Bottom value is the maximum beta/gamma contamination in dpm for an area <100 cm^2.

(5) // areas are first floor.

FIGURE 11: FINAL SURVEY OF SECOND & THIRD FLOOR MEZZANINES

URE 12: FINAL SURVEY - EAST AND SOUTH WALLS

EAST WALL (28 METER)

NORTH (12 Feet)

480 480	98 480	98 480	98 480	96 480	672 1248	98 480	98 480	480 480	96 480	98 480	98 480	96 480	96 480	98 480	98 480	98 48b	96 480
98 480	98 480	96 480	480 1632	98 480	480 1248	98 1248	864 2016	480 1248	480 864	480 864					96 480	98 480	9b 480
480 480	98 480	96 480	98 98	98 1248	98 864	98 480	98 96	98 98	98 96	98 98					98 98	98 98	96 98
480 2400	480 2400	96 2016	98 480	96 672	98 864	98 480	98 98	98 98	98 98	98 864					98 480	98 672	98 864

EAST WALL CONTINUED

NORTH (12 Feet)

480 864	864 1832	864 2016	672 2784	98 480	98 480	98 480	98 480	98 480	98 480
480 864	672 1248	480 1248	480 1248	96 480	98 480	98 480	98 480	98 480	98 480
98 864	98 480	98 480	98 98	98 98	98 98	98 98	98 98	98 98	98 96
98 864	98 480	98 98	98 1832	98 480	98 480	98 864	98 864	98 2016	98 98

SOUTH WALL (16 Meter)

EAST (12 Feet)

480 1248	480 1248	480 1246	480 1248	884 2016	864 1248	98 480	98 480	98 480	98 480	98 480	98 480	98 480	98 460	98 480	480 480
98 480	96 480	98 480	98 480	98 480	98 480	96 480	98 480	98 480	98 480	96 480	98 480	96 480	98 480	98 480	480 480
98 98	98 98	98 98	96 96	96 98	96 98	98 98	98 96	98 98	98 98	96 98	96 96	98 98	96 96	98 96	98 98
480 480	96 480	96 96	96 864	98 480	98 864	98 480	96 480	98 480	98 1632	98 480	98 480	96 480	98 480	98 480	98 480

Note:

(1) Levels were taken on walls after decontamination.

(2) Each unit represents 1 meter horizontally by 1 foot vertically.

(3) Average beta/gamma contamination in dpm/100 cm^2 in <1 square meter. (Top Number)

(4) Maximum beta/gamma contamination in dpm for an area <100 cm^2. (Bottom Number)

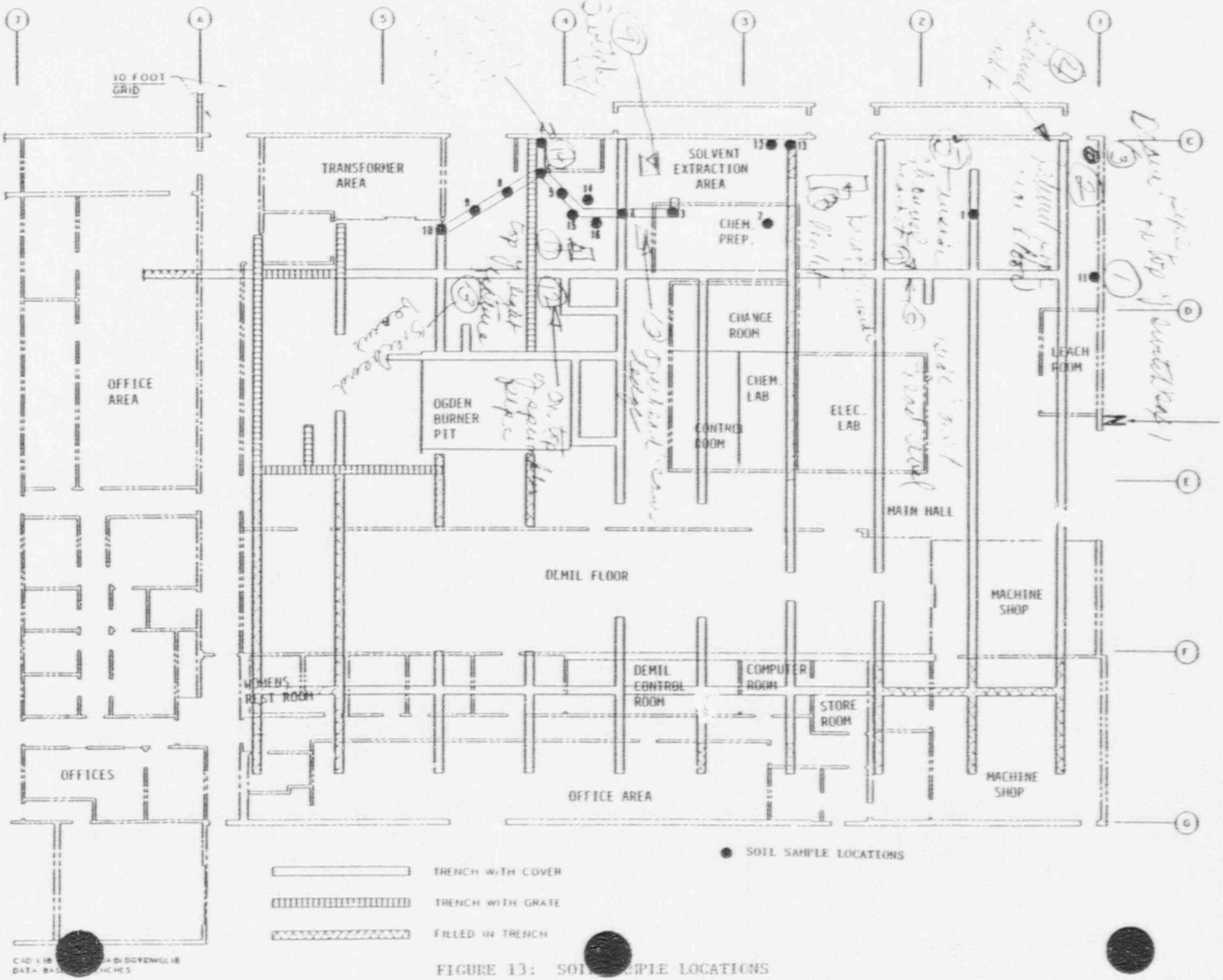


FIGURE 13: SOI MPLE LOCATIONS

TABLE I
ACCEPTABLE SURFACE CONTAMINATION LEVELS 1/ 2/

NUCLIDE[a]	AVERAGE[b, c] (dpm/100 cm^2)	MAXIMUM[b, d] (dpm/100 cm^2)	REMOVABLE[b, e] (dpm/100 cm^2)
a) U-nat, U-235, U-238, and associated decay products	5,000	15,000	1,000
b) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231 Ac-227, I-125, I-129	100	300	20
c) Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
d) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
e) H-3, C-14 except as DNA precursors f/	20,000	60,000	4,000

---

ere surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits tablished for alpha- and beta-gamma-emitting nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm^2.

The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

DNA precursors mean molecules or compounds that are directly incorporated into the DNA molecule during DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and nucleosides. The acceptable surface contamination levels for H-3 and C-14 in DNA precursors are as tabulated in paragraph (d) for beta-gamma-emitters.

USNRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, *Washington D.C. (June 1974)*

ANSI, Control of Radioactive Surface Contamination on Materials, Equipment and Facilities To Be Released for Uncontrolled Use, *final draft, proposed American National Standard N-328, Atomic Industrial Forum, Inc., N.Y. (June 1974)*

TABLE 2

Criteria for Soil Decontamination at the GA Site

Exposure Pathway	Target Criteria	Other Existing Criteria or Guidance
External Radiation (whole body)	10 µr/hr (35 mrem/yr)[(a)]	20 µr/hr indoor[(b)]-EPA cleanup standard for Inactive Uranium Processing Site; 500 mrem/yr-10 CFR 20; 170 mrem/yr-FRC Guidance; 400-900 mrem/yr-Surgeon General's Guidance for indoor exposure; 25 mrem/yr-40 CFR 190.
Inhalation of Particulates (lung, bone)	1 mrad/yr (lung) (20 mrem/yr)[(c)] 3 mrad/yr (bone) (60 mrem/yr)	1500 mrem/yr-10 CFR 20[(d)] 25 mrem/yr-40 CFR 190 1 mrad/yr (lung), 3mrad (bone) EPA Transuranic Guidance

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(a) This value does not include background, the 35 mrem/yr (realistic dose) includes shielding factor of 0.5 from building a residential home for general population and residence time 80 percent.

(b) 40 CFR Part 192 - Federal Register, April 22, 1980.

(c) Based on quality factor of 20 as originally intended for alpha emitted from the transuranic elements.

(d) Designated in or derived from 10 CFR 20.

TABLE 3

Individual Concentration in Soil Resulting in an Annual Inhalation Dose of 20 mrem to the Lung(1) and 60 mrem to the Bone(2)

Radionuclide	Solubility Classification	Derived Concentration (pCi/g)	
		Lung (20 mrem/yr)	Bone (60 mrem/yr)
U-238	Y	35	1.2×10^4
U-238	W	3.2×10^2	3.9×10^3
U-238	D	1.9×10^4	1.2×10^3
U-235	Y	35	1.2×10^4
U-235	W	3.2×10^2	3.9×10^3
U-235	D	1.9×10^4	1.2×10^3
U-234	Y	30	1.0×10^4
U-234	W	2.8×10^2	3.6×10^3
U-234	D	1.7×10^4	1.1×10^3
Th-232	Y	35	2.6×10^2
Th-232	W	3.3×10^2	1.0×10^2
Ra-228	W	3.3×10^3	2.9×10^3
Th-228[3]	Y	20	1.8×10^3
Th-228	W	1.3×10^2	3.3×10^2
Co-60[4]	Y	1.2×10^4	1.6×10^6
Co-60	W	1.2×10^5	5.8×10^6
Cs-137[4]	D	9.6×10^5	1.8×10^6
Sr-90	Y	1.8×10^3	2.6×10^5
Sr-90	D	1.6×10^6	2.8×10^4

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(1) Pulmonary lung (570 gm); consistent with EPA's Transuranic Guidance.

(2) Bone means osseous tissue (5,000 gm); consistent with EPA's Transuranic Guidance.

(3) The daughters of Th-228 and Ac-228 do not contribute significantly to the inhalation dose because of their comparatively short half-lives.

(4) Solubility classifications are based on ICRP-30.

TABLE 4

INITIAL SOIL SAMPLE RESULTS

	Radionuclide Concentration (pCi/g)						
Sample ID #	Co-60	Cs-137	Th-228	Ra-228	Ra-226	U-238	U-235
1	0.00 ± 0.00	0.00 ± 0.00	8.22 ± 0.44	8.97 ± 0.45	0.88 ± 0.09	0.00 ± 0.00	0.16 ± 0.06
2	0.00 ± 0.00	0.02 ± 0.01	6.70 ± 0.35	7.79 ± 0.39	0.74 ± 0.04	10.95 ± 0.76	0.41 ± 0.08
3	0.00 ± 0.00	0.01 ± 0.01	0.61 ± 0.05	0.60 ± 0.03	0.39 ± 0.02	1.10 ± 0.20	0.18 ± 0.04
4	0.00 ± 0.00	0.00 ± 0.00	0.80 ± 0.06	0.81 ± 0.04	0.49 ± 0.06	1.22 ± 0.22	0.04 ± 0.03
5	0.00 ± 0.00	0.00 ± 0.00	0.83 ± 0.06	0.75 ± 0.04	0.45 ± 0.06	0.00 ± 0.00	0.04 ± 0.03
6	0.00 ± 0.00	0.00 ± 0.00	0.89 ± 0.06	0.98 ± 0.05	0.58 ± 0.03	1.20 ± 0.23	0.05 ± 0.03
7	0.00 ± 0.00	0.21 ± 0.03	5.90 ± 0.32	7.79 ± 0.39	0.91 ± 0.08	33.59 ± 1.86	1.19 ± 0.14
8	0.00 ± 0.00	0.00 ± 0.00	0.61 ± 0.05	0.62 ± 0.03	0.42 ± 0.06	0.78 ± 0.26	0.04 ± 0.02
9	0.00 ± 0.00	0.13 ± 0.02	0.95 ± 0.07	0.95 ± 0.05	0.60 ± 0.07	0.94 ± 0.21	0.06 ± 0.03
10	0.00 ± 0.00	0.01 ± 0.01	2.94 ± 0.17	3.28 ± 0.16	0.61 ± 0.04	15.58 ± 0.93	0.52 ± 0.07
11	0.00 ± 0.00	0.06 ± 0.02	2.32 ± 0.15	2.42 ± 0.12	1.04 ± 0.05	3.60 ± 0.37	0.19 ± 0.07
12	0.00 ± 0.00	0.01 ± 0.01	3.40 ± 0.20	3.82 ± 0.19	0.87 ± 0.04	0.00 ± 0.00	0.09 ± 0.05
13	0.00 ± 0.00	0.01 ± 0.01	1.30 ± 0.09	1.46 ± 0.07	0.98 ± 0.05	8.05 ± 0.56	0.19 ± 0.07
14	0.00 ± 0.00	0.01 ± 0.01	1.20 ± 0.01	0.94 ± 0.05	0.56 ± 0.03	0.93 ± 0.23	0.03 ± 0.02
15	0.00 ± 0.00	0.00 ± 0.00	13.73 ± 0.72	9.31 ± 0.47	1.02 ± 0.05	0.00 ± 0.00	0.01 ± 0.05
16	0.00 ± 0.00	0.00 ± 0.00	1.29 ± 0.10	1.23 ± 0.06	0.74 ± 0.04	1.57 ± 0.28	0.11 ± 0.05
Composite Soil Sample	0.09 ± 0.01	0.17 ± 0.01	5.44 ± 0.05	6.18 ± 0.09	1.13 ± 0.05	7.92 ± 0.89	0.25 ± 0.06

TABLE 5

FINAL SOIL SAMPLE RESULTS

Sample	Radionuclide Concentration (pCi/g)						
ID #	Co-60	Cs-137	Th-228	Ra-228	Ra-226	U-238	U-235
1	0.00 ± 0.00	0.01 ± 0.01	1.52 ± 0.03	1.68 ± 0.08	0.82 ± 0.09	0.00 ± 0.00	0.08 ± 0.04
2	0.00 ± 0.00	0.00 ± 0.00	1.00 ± 0.08	1.05 ± 0.05	0.60 ± 0.03	1.26 ± 0.30	0.08 ± 0.04
3	0.00 ± 0.00	0.01 ± 0.01	0.61 ± 0.05	0.60 ± 0.03	0.39 ± 0.02	1.10 ± 0.20	0.18 ± 0.04
4	0.00 ± 0.00	0.00 ± 0.00	0.80 ± 0.06	0.81 ± 0.04	0.49 ± 0.06	1.22 ± 0.22	0.04 ± 0.03
5	0.00 ± 0.00	0.00 ± 0.00	0.83 ± 0.06	0.75 ± 0.04	0.45 ± 0.06	0.00 ± 0.00	0.04 ± 0.03
6	0.00 ± 0.00	0.00 ± 0.00	0.89 ± 0.06	0.98 ± 0.05	0.56 ± 0.03	1.20 ± 0.23	0.05 ± 0.03
7	0.00 ± 0.00	0.04 ± 0.01	1.48 ± 0.10	1.54 ± 0.08	0.95 ± 0.09	4.22 ± 0.60	0.16 ± 0.06
8	0.00 ± 0.00	0.00 ± 0.00	0.61 ± 0.05	0.62 ± 0.03	0.42 ± 0.06	0.78 ± 0.20	0.04 ± 0.02
9	0.00 ± 0.00	0.13 ± 0.02	0.95 ± 0.07	0.95 ± 0.05	0.60 ± 0.07	0.94 ± 0.21	0.06 ± 0.03
10	0.00 ± 0.00	0.01 ± 0.01	1.44 ± 0.10	1.40 ± 0.07	0.76 ± 0.08	5.99 ± 0.49	0.25 ± 0.07
11	0.00 ± 0.00	0.06 ± 0.02	2.32 ± 0.15	2.42 ± 0.12	1.04 ± 0.05	3.60 ± 0.37	0.19 ± 0.07
12	0.00 ± 0.00	0.01 ± 0.01	3.40 ± 0.20	3.82 ± 0.19	0.87 ± 0.04	0.00 ± 0.00	0.09 ± 0.05
13	0.00 ± 0.00	0.01 ± 0.01	1.30 ± 0.09	1.46 ± 0.07	0.98 ± 0.05	8.05 ± 0.56	0.19 ± 0.07
14	0.00 ± 0.00	0.00 ± 0.00	1.20 ± 0.10	0.94 ± 0.05	0.56 ± 0.03	0.93 ± 0.23	0.03 ± 0.02
15	0.00 ± 0.00	0.01 ± 0.01	1.58 ± 0.10	1.71 ± 0.09	1.13 ± 0.06	2.62 ± 0.28	0.12 ± 0.06
16	0.00 ± 0.00	0.00 ± 0.00	1.29 ± 0.10	1.23 ± 0.06	0.74 ± 0.04	1.57 ± 0.28	0.11 ± 0.05

TABLE 6: CONTAMINATION SURVEY RESULTS

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ER 95%
First Floor					
1 BLDG W-1 Elect Panel By Stairs	1.	<1.084E-02	95.00	<1.108E 00	95.00
2 6/10/87 Floor & Pipes	1.	6.057E-01	150.65	<7.109E-01	95.00
3 Wall	1.	<1.084E-02	95.00	<1.108E 00	95.00
4 Tubes	1.	6.057E-01	150.65	8.376E-01	136.65
5 Posts	1.	9.349E-01	119.54	1.338E 00	101.48
6 Machine Shop Trench	1.	<1.084E-02	95.00	1.668E 00	86.63
7 Trench	1.	<1.084E-02	95.00	<7.109E-01	95.00
8 Floor	1.	<1.084E-02	95.00	<2.714E-02	95.00
9 Floor	1.	6.057E-01	150.65	<7.109E-01	95.00
10 Wall	1.	2.692E-01	239.69	1.105E 01	30.66
11 Floor	1.	<1.084E-02	95.00	<1.108E 00	95.00
1 Shop Trench	1.	<1.084E-02	95.00	6.255E-01	163.
13 Trench	1.	6.057E-01	150.65	<1.108E 00	95.00
14 Walls Including Tubes		1.264E 00	102.09	2.353E 00	72.13
15 Posts	1.	9.349E-01	119.54	<7.109E-01	95.00
16 Trench	1.	2.765E-01	233.36	1.644E 00	87.96
17 Trench	1.	<1.084E-02	95.00	<2.728E-01	95.00
18 Trench	1.	<1.084E-02	95.00	6.255E-01	163.38
19 Floor	1.	<1.084E-02	95.00	<7.109E-01	95.00
20 Floor	1.	<1.084E-02	95.00	<1.108E 00	95.00
21 Floor	1.	<1.084E-02	95.00	6.255E-01	163.38
22 Stairs	1.	1.264E 00	102.09	7.044E 00	39.08
Second Floor					
23 Outside rails South	1.	2.581E 00	70.71	2.256E 00	75.36
24 Floor South	1.	9.349E-01	119.54	8.133E-01	140.85

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

TABLE 6: CONTAMINATION SURVEY RESULTS

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID		COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
Second Floor						
25	South Floor 2	1.	<1.084E-02	95.00	<2.729E-01	95.00
26	Floor East 3	1.	2.765E-01	233.36	<1.108E 00	95.00
27	Pipes South	1.	1.922E 00	82.21	2.044E 00	79.24
28	3rd Floor	1.	6.057E-01	150.65	8.376E-01	136.65
29	Floor 4	1.	<1.084E-02	95.00	8.862E-01	128.93
30	South Rails	1.	2.765E-01	233.36	6.017E-01	170.16
31	Floor 4	1.	6.057E-01	150.65	8.376E-01	136.65
32	Floor 5	1.	2.765E-01	233.36	<1.108E 00	95.00
33	Rails Middle	1.	1.593E 00	90.55	2.048E 00	78.30
34	Rails North	1.	9.349E-01	119.54	1.335E 00	101.48
35	Floor Middle	1.	6.057E-01	150.65	1.359E 00	99.60
	Floor North 6	1.	<1.084E-02	95.00	6.253E-01	163.38
37	Floor North 7	1.	2.725E-01	236.77	5.838E 00	40.87
38	Floor North 8	1.	2.581E 00	70.71	2.256E 00	75.36
39	Floor	1.	<1.084E-02	95.00	<1.108E 00	95.00
40	Rails North Outside	1.	2.747E-01	234.91	2.450E 00	69.16
41	Cat Walk 1 South	1.	2.765E-01	233.36	<1.108E 00	95.00
42	Cat Walk 2 South	1.	9.349E-01	119.54	1.335E 00	101.48
43	Cat Walk 3 South	1.	9.349E-01	119.54	<7.109E-01	95.00
44	Cat Walk 4 Middle	1.	<1.084E-02	95.00	8.862E-01	128.93
45	Cat Walk 5 North	1.	6.057E-01	150.65	<7.109E-01	95.00
46	Duct (Striped)	1.	2.765E-01	233.36	<1.108E 00	95.00
47	Duct (White)	1.	9.349E-01	119.54	<1.108E 00	95.00
48	Pipes NE Corner	1.	2.765E-01	233.36	8.619E-01	132.68

TE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

		ALPHA		BETA	
SAMPLE ID	COUNT LENGTH MIN	DPM/100 SQ.CM.	% ERROR 95% CL	DPM/100 SQ.CM.	% ER 95%
49 Rails	1.	2.765E-01	233.36	1.108E 00	95.06
50 Rails	1.	4.057E-01	150.65	1.098E 00	154.12
AVERAGE		3.283E-01		1.501E 00	

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
09 CON W	1.	6.024E-01	151.48	<1.082E 00	95.00
2 2/17/87	1.	6.024E-01	151.48	<6.849E-01	95.00
3	1.	2.732E-01	236.17	<2.468E-01	95.00
4	1.	<1.117E-02	95.00	<2.468E-01	95.00
5	1.	2.732E-01	236.17	5.752E-01	177.88
6	1.	2.732E-01	236.17	8.358E-01	136.82
7	1.	2.732E-01	236.17	5.752E-01	177.88
8	1.	<1.117E-02	95.00	5.995E-01	170.49
9	1.	1.261E 00	102.35	<1.082E 00	95.00
10	1.	<1.117E-02	95.00	5.995E-01	170.49
AVERAGE		3.592E-01		6.027E-01	

OTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

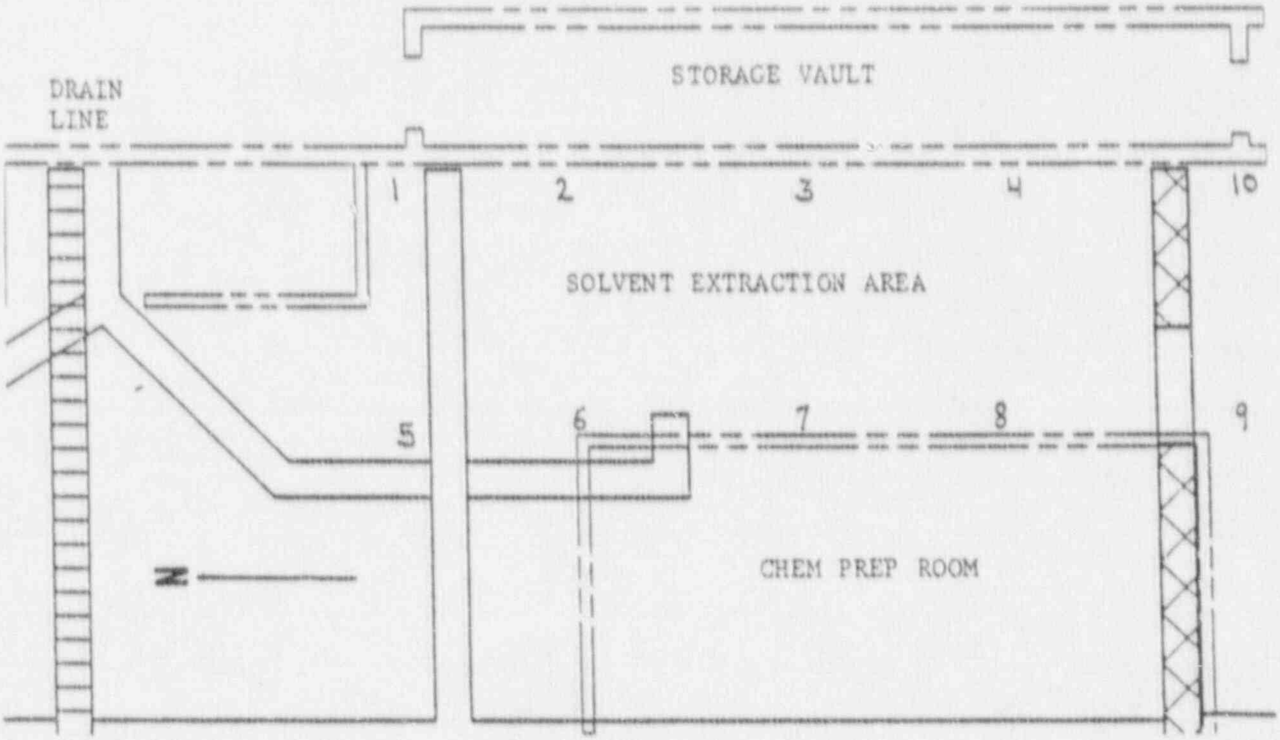


TABLE 7: CONTAMINATION SURVEY OF SOLVENT EXTRACTION AREA

TABLE 8: CONTAMINATION SURVEY OF PIPES, BEAMS, DUCTS AND ROOF

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
3/17/87					
W Crane Beam	1.	1.117E-02	95.00	2.168E-01	95.00
W Crane Beam	1.	9.316E-01	119.96	2.090E 00	77.39
3 E water Pipe	1.	1.919E 00	82.73	3.842E 00	54.41
4 E Water Pipe	1.	1.590E 00	90.71	4.521E 00	95.50
5 E Crane Beam	1.	3.236E 00	63.05	6.372E 00	40.91
6 E Crane Beam	1.	6.024E-01	151.48	9.113E-01	161.04
7 S Blower Duct	1.	6.024E-01	151.48	1.072E 00	112.90
8 S Blower Duct	1.	1.919E 00	82.73	1.496E 00	95.40
9 N Ceiling Beam	1.	6.024E-01	151.48	1.393E 00	90.79
10 S Ceiling Beam	1.	2.732E-01	236.17	<1.083E 00	95.00
AVERAGE		1.169E 00		2.063E 00	
4/21/87					
NORTH BEAM	1.	5.596E-01	163.07	1.515E 00	101.26
NORTH PIPE	1.	1.876E 00	84.23	<1.691E 00	95.00
C.R.ROOF	1.	5.596E-01	163.07	<1.119E 00	95.00
SOUTH BEAM	1.	2.535E 00	72.00	1.109E 00	137.91
AVERAGE		1.383E 00		1.358E 00	

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

GA Technologies

GA Technologies Inc.
P.O. BOX 85608
SAN DIEGO, CALIFORNIA 92138
(619) 455-3000

November 18, 1987
696-1146

Mr. Robert D. Thomas
Chief of Nuclear Materials Safety Section
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596-5368

Subject: Docket 70-734: SNM-696; Request for Release to Unrestricted Use

Dear Mr. Thomas:

Pursuant to our recent telephone conversation regarding our request for NRC's confirmatory survey of several laboratories located in GA Technologies Inc.'s (GA) Building 2, enclosed is the final report describing the areas to be surveyed and summarizing the results of GA's surveys.

During October and November of 1987, GA cleared a number of laboratories on the lower floor of the Laboratory B section of Building 2 (also known as the Science Laboratories Building). GA does not plan to conduct any future activities involving radioactive materials in the laboratories and would like to lease them to outside companies. The offices across the hall from these laboratories, which have never been used for work involving radioactive materials, may also be leased to outside companies. Accordingly, GA is requesting the release of these laboratories and their associated offices to unrestricted use.

It should be noted that these outside companies may use radioactive materials in the laboratories, but would do so under their own radioactive materials license.

A total of 20 laboratories will be leased to outside companies. Five of these laboratories have never been used for work involving radioactive materials. Only five of the fifteen laboratories required decontamination beyond the removal of sources and contaminated equipment. These laboratories represent a total of 1,440 ft^2. The decontamination effort involved normal washing of floors, some tiles being removed, and about 12 ft^2 of concrete being scabbled.

Because the new tenants are scheduled to move into these laboratories December 1, we request that your survey be conducted as soon as possible. If you have any questions regarding this matter, please call Laura Quintana at (619) 455-2758.

Very truly yours,

Laura R. Quintana for

Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

KEA/mk
Enclosure

DECONTAMINATION OF SELECTED GA TECHNOLOGIES'
SCIENCE LABORATORIES FOR RELEASE
TO UNRESTRICTED USE

NOVEMBER 18, 1987

TABLE OF CONTENTS

LIST OF ATTACHMENTS

INTRODUCTION

During October and November 1987, GA Technologies Inc. cleared a number of laboratories in Building 2 (also known as the Science Laboratories Building).

GA has no plans for conducting any future activities involving radioactive materials in the laboratories and would like to lease them to outside companies. The offices across the hall from these laboratories which have never been used for work involving radioactive materials may also be leased to outside companies. Accordingly, GA is requesting the release of these laboratories and their associated offices to unrestricted use. The outside companies may use radioactive materials in the laboratories but would do so under their own Radioactive Materials License.

A total of 20 laboratories will be leased to outside companies. Five (5) of these laboratories have never been used for work involving radioactive materials. Only five (5) of the other fifteen (15) laboratories required decontamination beyond the removal of sources and contaminated equipment. These laboratories represent a total of 1440 ft^2. The decontamination effort involved normal washing of floors, some tiles being removed and about 15 ft^2 of concrete being scabbled.

GA has decontaminated equipment and facilities consistent with both the USNRC'S and the State of California's guidelines for Release of Facilities and Equipment to Unrestricted Use. The results of the final surveys are included in this report.

SITE DESCRIPTION

The location of Building 2 with respect to other facilities on the GA Site is shown in Attachment 1. A layout of the Building 2 is shown in Attachment 2. The building is divided into three Laboratory sections; Laboratory B, C, and A. Laboratory B includes offices and laboratories from 102 through 243. Laboratory C includes offices and laboratories from 300 through 445 and Laboratory A includes offices and laboratories from 502 through 651. The laboratories which will be released to unrestricted use are located in the lower floor of the Laboratory B section (excluding labs 130, 132 and 134) and are shown in Attachment 3. The laboratories (20) are 102, 104, 107, 109, 111, 113, 115, 117, 119, 122, 128, 137, 139, 141, 143, 145, 147, 149, 151, and 154. Laboratories 109 and 111, 115 and 117, and 119 and 122 are combined labs.

Two laboratories (115 and 119) have mezzanines. There was no known use of radioactive materials in the 115 mezzanine. The mezzanine in lab 119 had a storage cabinet which contained only sealed sources, which have been removed.

The total area of the twenty (20) labs is 7561 ft^2 including the mezzanines. Of this, only 1440 ft^2 required decontamination other than the removal of sources or contaminated equipment. These were laboratories 115/117, and 141, 143 and 145. The decontamination required surface cleaning of the floors (115/117), or removal of contaminated floor tiles and about 15 ft^2 total area of concrete was scabbled (labs 141, 143, and 144).

INSTRUMENTATION AND MEASUREMENT LIMITS FOR RELEASE

Instrumentation

1. Beta/gamma counters

   Model TBM 28 geiger counters manufactured by Technical Associates were used to survey surfaces for beta/gamma contamination. The instruments contain a pancake Geiger-Mueller (GM) detector which has a window thickness of less than 7 mg/cm^2. The instrument has three ranges covering from 0-50,000 counts per minute (cpm).

3. Gamma Detectors

   a. Model 19 microR meters with NaI scintillation detectors manufactured by Ludlum Measurements Inc. were used in all locations. The instrument has three ranges from 0 - 5 mR/hr

b. Gamma spectral analysis on selected samples were performed using a high purity germanium detector manufactured by Canberra Industries, Inc.

All portable instruments are calibrated using a nominal 30 curie Cs-137 source. The alpha/beta systems and the germanium detector system has been calibrated for various type of samples. This calibration is checked on a daily or weekly basis depending on usage.

Measurement Limits for Release

1. Background
   A "standard" natural background was determined for each instrument and subtracted from the survey readings. All of the surface beta/gamma readings were completed using the TBM Model 28 GM counters which have a background concrete reading of 80 plus or minus 20 counts per minute. Any reading over 100 cpm was considered positive and was cleaned.

2. Efficiency and Geometry corrections
   Because of the different radionuclides found in these laboratories, an instrument efficiency calibration was not completed. Instead, every area found to have contamination above the natural background levels given above was decontaminated to background levels. The release criteria would have been higher than this if the radionuclides and efficiencies had been taken into account.

PREVIOUS LABORATORY ACTIVITIES AND EFFORT OF DECONTAMINATION REQUIRED

A brief description of the previous use of these 20 laboratories is provided below as well as the total area of each.

Case 1: No History of Use of Radioactive Materials (Cursory survey Completed)

Five of these laboratories 102, 104, 107, 109, 111 and 151 had never been used for work involving radioactive material. The total area (ft^2) is as follows:

102	344
104	252
107	324
107 Mez	697
109	576
	2193 ft^2

A meter survey using a TBM-28 geiger and a microR meter was conducted in all of these laboratories. There was no radioactive material or contamination found.

Case 2: Possible Use of Radioactive Material Prior to 1975

137	288
139	288
151	288
	864 ft^2

There has not been any work involving radioactive materials in these laboratories in the past 12 years. Records were not reviewed past this time. A survey using the GM counter and a microR meter was conducted. No radioactive material or contamination was detected.

Case 3: Radioactive Material Used in Laboratories Since 1975

Records show that the following laboratories have used radioactive material in the past 12 years. The labs were primarily used for Research and Development. The labs and the area in ft^2 are provided below.

113	288
115	576
115 Mez	408
119	672
119 Mez	448
128	288
137	288
139	288
141	288
143	288
145	288
147	288
149	288
151	288
154	384
	5368 (with Mezzanines, called Mez above)

Laboratory 113 had been used in the past five years for various Reseach and Development work. All sources and contaminated equipment were removed from the lab. A survey was conducted using the GM and mircoR meter; no contamination was detected.

Laboratories 119/122 was used by the Health Physics group to analyze samples for radioactivity. All radioactive liquids were collected in an approved container and transferred to the Waste Processing Facility for proper disposal. A hood and oven were used to process samples and have been cleaned. There was no contamination found on the counters or floor of the laboratory, including the mezzanine area.

Laboratory 128, 137, and 139 have not been used recently (for about the past five years). A survey showed no contamination present.

Labs which needed decontamination in Phase 3: (beyond the removal of sources and contaminated equipment)

115/117	408
141	288
143	288
144	288
	1440 ft^2 (Included in 5368 ft^2 above)

Laboratory 115/117 was used until recently. The laboratory contained contaminated equipment, hoods, ducts, ovens, etc. which were contaminated with mixed fission products. All of the eqipment has been removed. There wa some slight contamination of the floor which was removed by washing the floor. A detailed survey was conducted.

Laboratories 141, 143 and 145 required the most decontamination effort. The floors in 141, 143 and 145 required washing and in some cases the removal of floor tiles and a total of about 12 ft^2 of concrete was scabbled in these labs. The scabbling was required after contamination was detected under the hoods. All of the labs contained contaminated equipment and materials. In lab 141, six linear feet of piping had to be decontaminated from the walls and about 3.5 ft^2 area of concrete was scabbled. Lab 141 has been left with the scabbled concrete exposed and the original floor tile. Lab 143 had about six linear feet of pipes decontaminated and also and about a 2 ft^2 area of concrete was scabbled. In addition, about one ft^2 of wall was removed. Lab 145 had five linear feet of pipes decontaminated and about 2 ft^2 of concrete scabbled. The concrete in labs 143 and 145 have been repoured and a few new tiles has been placed in these areas.

In all about 17 linear feet of pipes were decontaminated, one ft^2

of wall and 12 ft^2 area of concrete was scabbled.

Laboratories 147, 149, 151 and 154 may have been used many years ago, but new concrete was poured in 1982 or 1983 after some flooding in these labs (according to Facilities personnel). New tile has also been installed several times since their use. Surveys completed in these laboratories showed no contamination.

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Table I (Attachment 4) is taken from USNRC's criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into our SNM-696 license. The State of California's limits for release of facilities and equipment to unrestricted use are identical to these limits for the radionuclides of concern (predominantly U-238, Cs-137, U-235 and Co-60). These guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," are also known as "DECON-1". GA has decontaminated the laboratories below the limits specified in both these Tables.

FINAL CONTAMINATION SURVEYS

Contamination surveys were conducted in the laboratories although the floors had been washed which eliminates the probability of removable contamination. The locations of the wipe samples collected in the laboratories are shown in Attachment 5 and the results are shown in Attachment 6. The wipe samples were counted in a calibrated low level alpha/beta/gamma counting system manufactured by Canberra Industries Inc. The contamination levels in every location were < 20 dpm/100 cm^2 area, and well below the Table 1 limits (Attachment 4) for removable contamination.

FINAL RADIATION SURVEYS

Final radiation surveys of the laboratories were conducted using the TBM-28 GM counters. The results of these surveys are shown in Attachments 7 through 12 as described below. All areas were decontaminated to the background radiation (80 cpm +/- 20 cpm) which explains the dpm value of zero in all the final radiation surveys. Radiation levels above background levels are given in dpm/100 cm^2, both for the average (top value) in a 1 m^2 or less area and the maximum (bottom value) in a 100 cm^2 area. It can be seen that all values are below the Table I limits (Attachment 4). The final surveys are presented in the Attachments as follows:

Attachment 7:	Final Surveys LABS 113, 115/117
Attachment 8:	Final Surveys LABS 119/122, 128
Attachment 9:	Initial and Final Survey LAB 141
Attachment 10:	Initial and Final Survey LAB 143
Attachment 11:	Initial and Final Survey LAB 145
Attachment 12:	Final Survey LABS 147, 149, 154

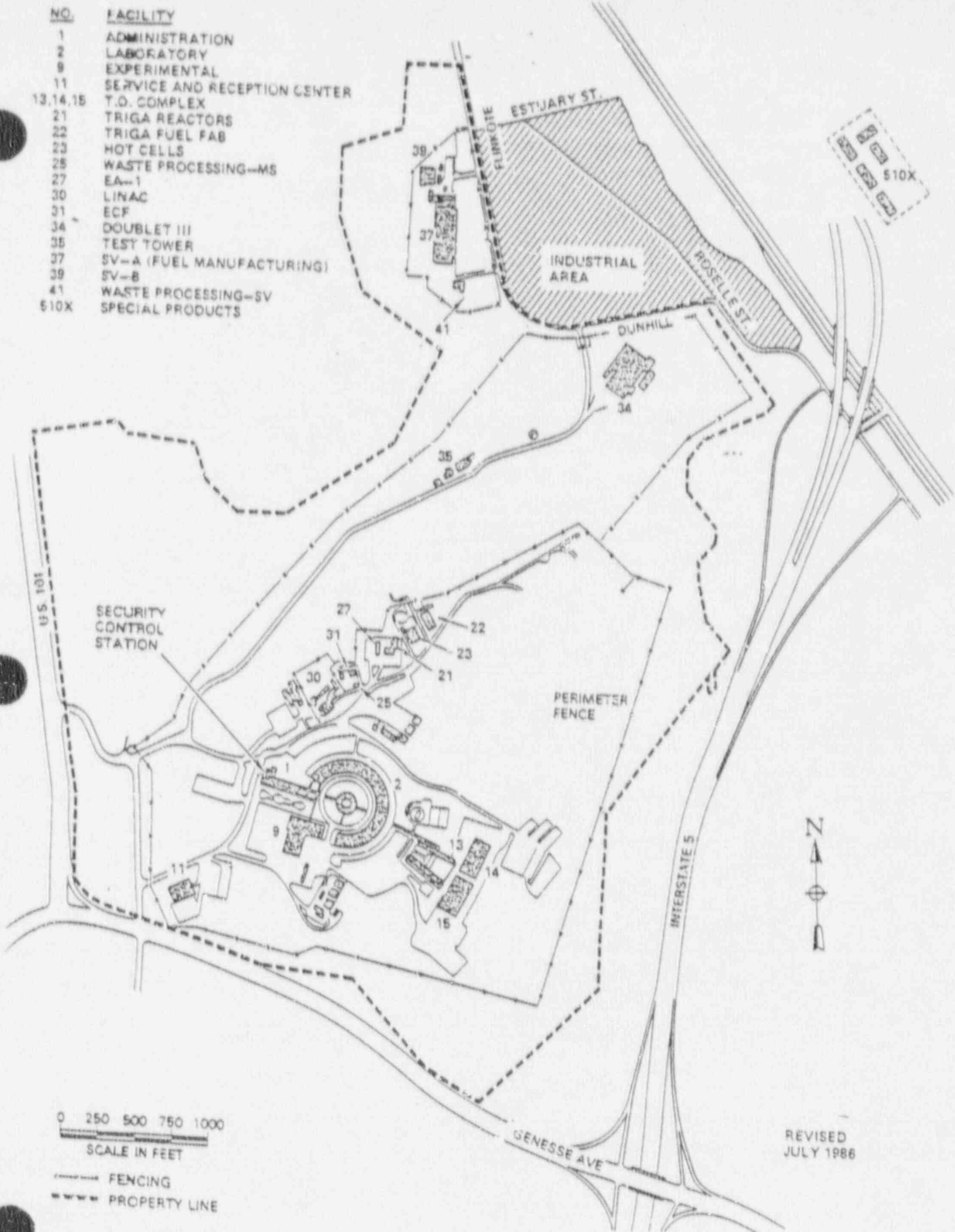
A microR meter manufactured by Ludlum Measurements was also used to survey the laboratories. Levels were recorded in various locations of each laboratory and have been provided in the final surveys. The measurements [illegible] all within normal background levels.

COMPLIANCE WITH THE TARGET CRITERIA

The laboratories were cleared of all radioactive material sources. Contaminated equipment was either decontaminated to natural background levels or was disposed of as radioactive waste. All floors and concrete surfaces were also decontaminated to background levels and therefore meet the limits in Table 1 (Attachment 4). The final surveys provided in this report demonstrate compliance with the criteria for release to unrestricted use.

CONCLUSION

Twenty (20) Laboratories have been cleared for release to unrestricted use. Five (5) of the laboratories required decontamination beyond the removal of sources and contaminated equipment. Of these there was only about 15 ft^2 of concrete which required scabbling to remove the contamination. The levels in all twenty laboratories are well below the criteria for release to unrestricted use.



NO.	FACILITY
1	ADMINISTRATION
2	LABORATORY
9	EXPERIMENTAL
11	SERVICE AND RECEPTION CENTER
13,14,15	T.O. COMPLEX
21	TRIGA REACTORS
22	TRIGA FUEL FAB
23	HOT CELLS
25	WASTE PROCESSING—MS
27	EA—1
30	LINAC
31	ECF
34	DOUBLET III
35	TEST TOWER
37	SV—A (FUEL MANUFACTURING)
39	SV—B
41	WASTE PROCESSING—SV
510X	SPECIAL PRODUCTS

ATTACHMENT 1: PLAN VIEW OF SITE

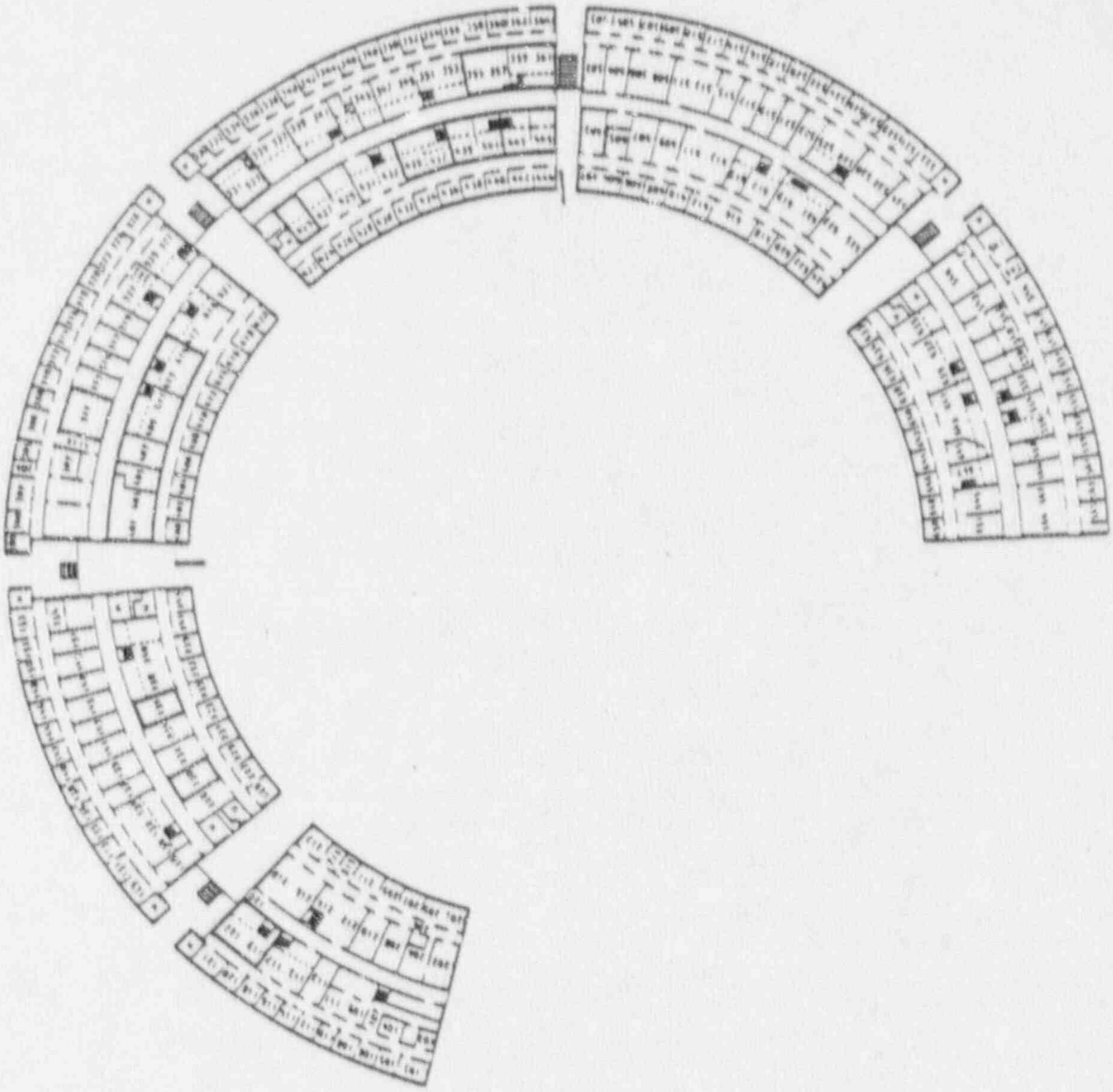
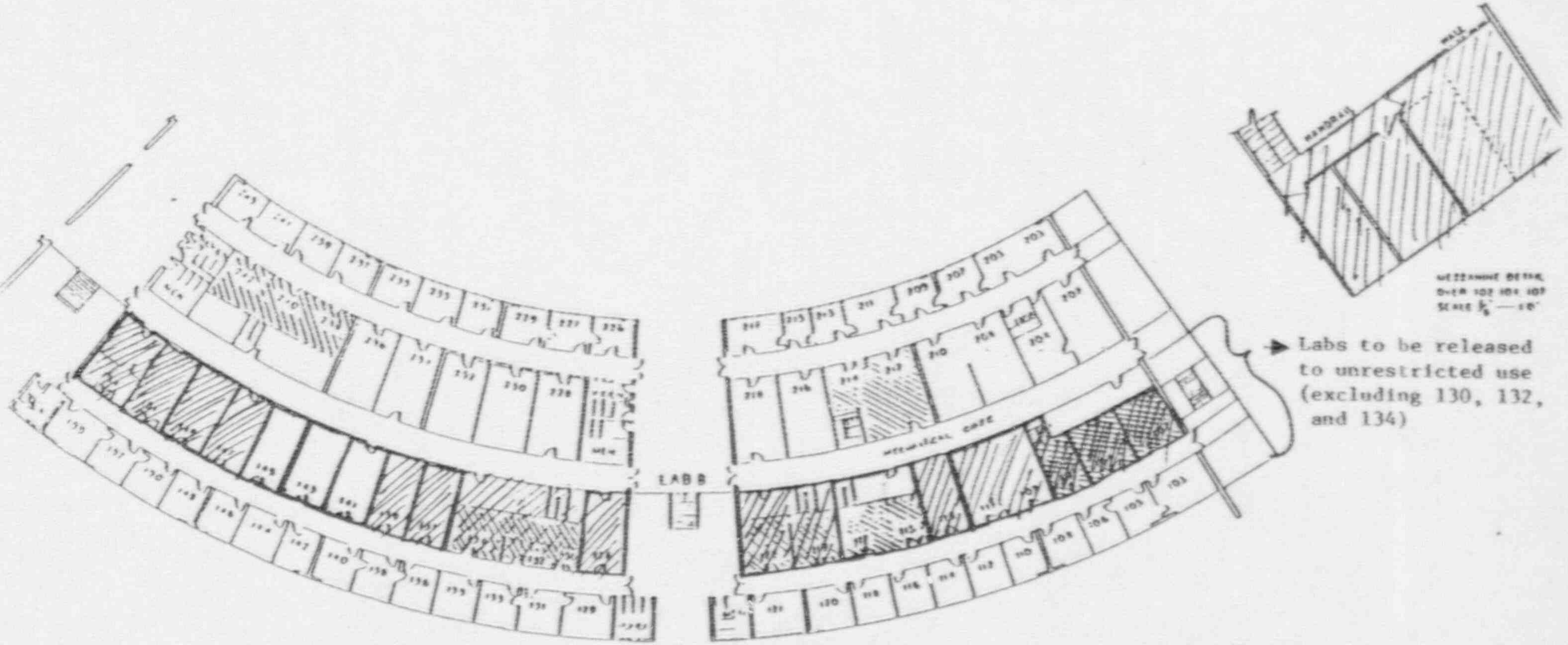


Fig. II 1-1. L Building Complex

ATTACHMENT 2

[redacted]



→ Labs to be released
to unrestricted use
(excluding 130, 132,
and 134)

LABORATORY B
BUILDING 2

▨ MEZZANINE

ATTACHMENT 3

ATTACHMENT 4

TABLE I
ACCEPTABLE SURFACE CONTAMINATION LEVELS1/2/

NUCLIDE[a]	AVERAGE[b, c] (dpm/100 cm^2)	MAXIMUM[b, d] (dpm/100 cm^2)	REMOVABLE[b] (dpm/100 cm^2)
a) U-nat, U-235, U-238, and associated decay products	5,000	15,000	1,000
b) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231 Ac-227, I-125, I-129	100	300	20
c) Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
d) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
e) H-3, C-14 except as DNA precursors f/	20,000	60,000	4,000

Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the li established for alpha- and beta-gamma-emitting nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactiv material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

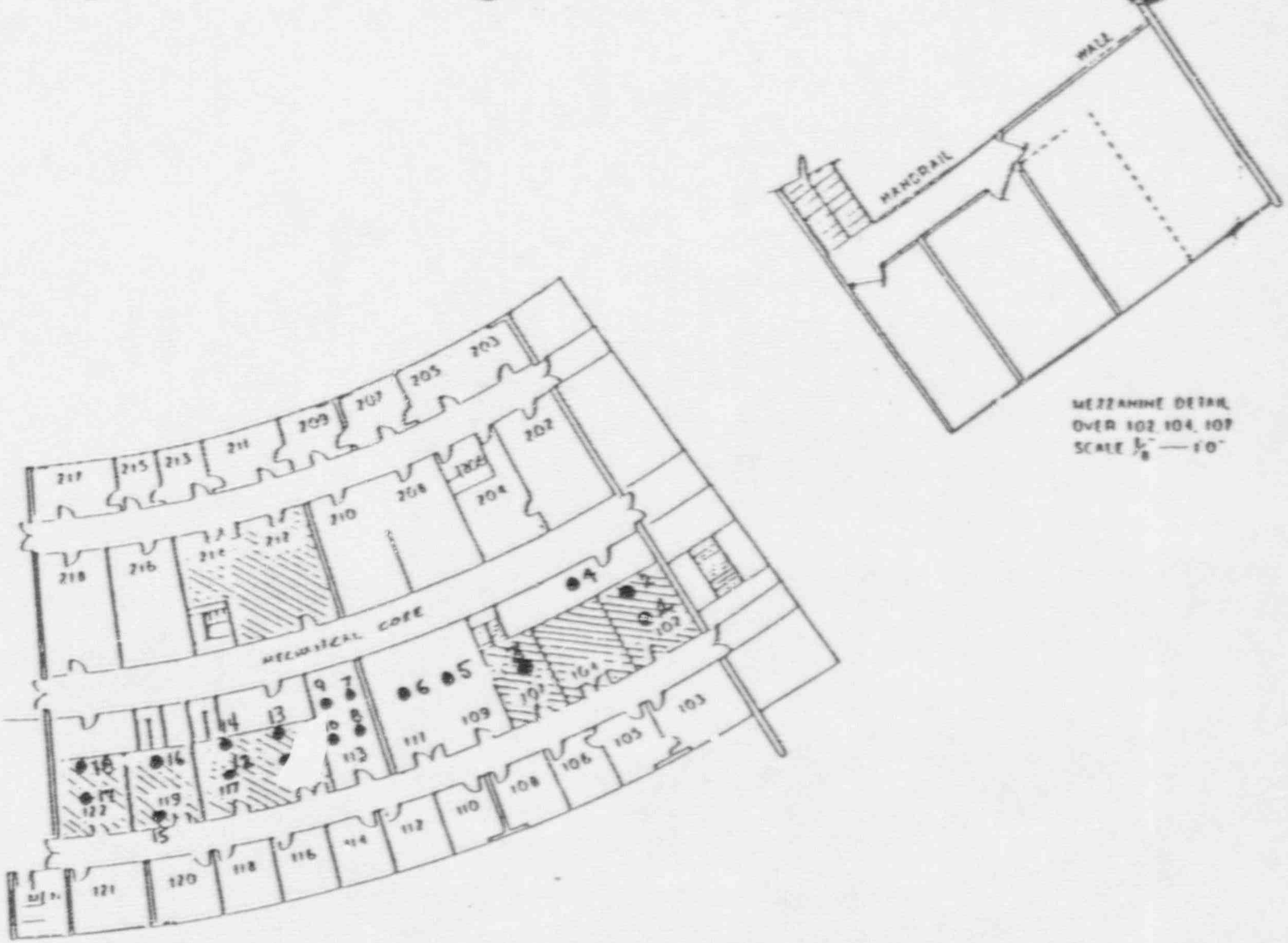
The maximum contamination level applies to an area of not more than 100 cm^2.

The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

DNA precursors mean molecules or compounds that are directly incorporated into the DNA molecule during DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and nucleosides. The acceptable surface contamination levels for H-3 and C-14 in DNA precursors are as tabulated in paragraph (d) for beta-gamma-emitters.

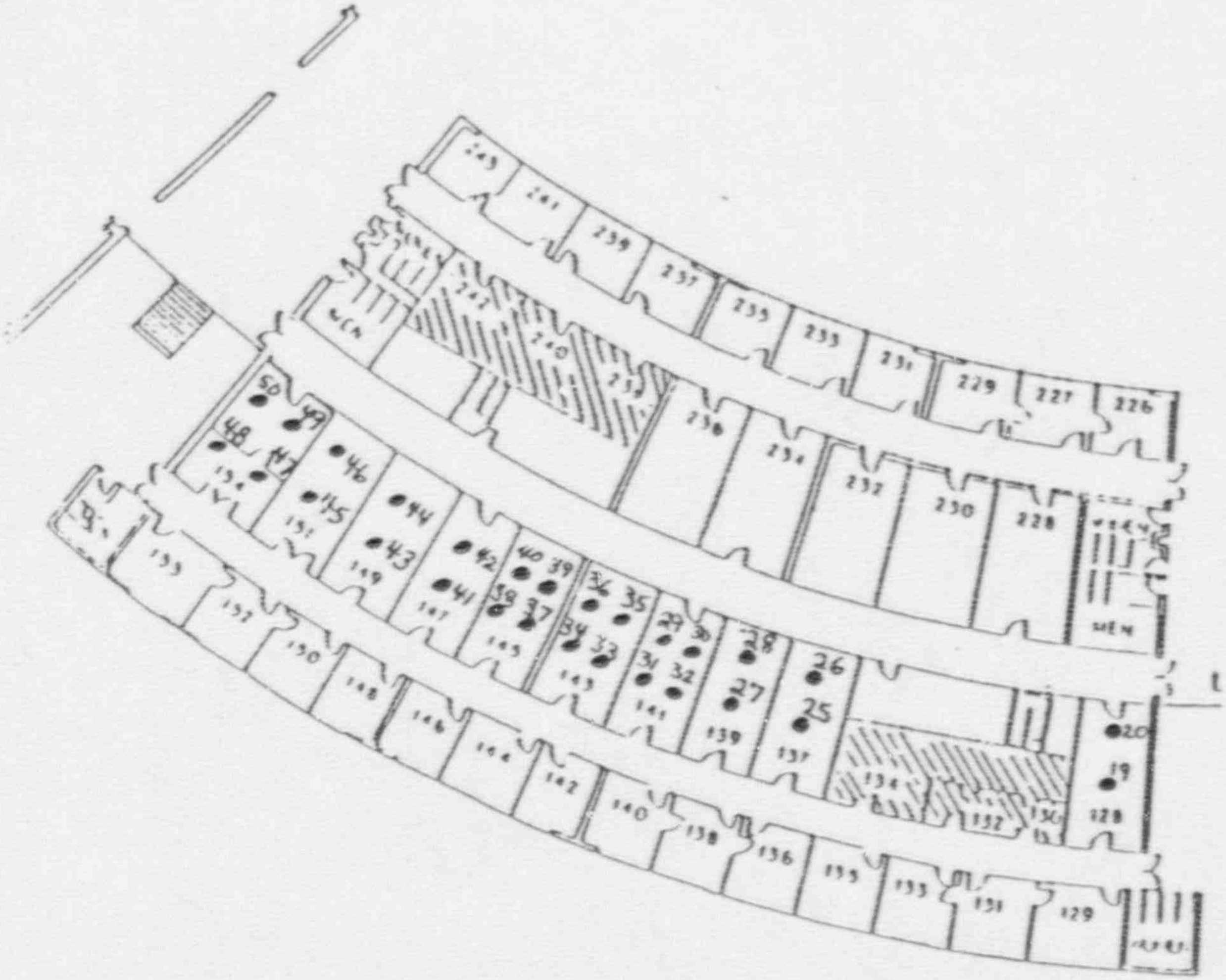
USNRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, Washi D.C. (June 1974)

ANSI, Control of Radioactive Surface Contamination on Materials, Equipment and Facilities To Be Released for Uncontrolled Use, final draft, proposed American National Standard N-328, Atomic Industrial Forum, Inc., N.Y. (June 1974)



ATTACHMENT 5: CONTAMINATION SURVEY WIPE LOCATIONS

ATTACHMENT 5
Page 2 of 2



Attachment 6: Contamination Survey Results

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
BLDG 2 W-1 Lab102	1.	<1.212E-02	95.00	<1.252E 00	95.00
2 11/3/87 Lab 102	1.	<1.212E-02	95.00	<1.252E 00	95.00
3 Lab 104	1.	<1.212E-02	95.00	<1.252E 00	95.00
4 Lab 107	1.	<1.212E-02	95.00	<1.721E 00	95.00
5 Lab 109	1.	<1.212E-02	95.00	<1.252E 00	95.00
6 Lab 109/111	1.	<1.212E-02	95.00	9.756E-01	146.13
7 Lab 113	1.	<1.212E-02	95.00	1.626E 00	103.73
Lab 113	1.	<1.212E-02	95.00	<1.721E 00	95.00
9 Lab 113	1.	<1.212E-02	95.00	9.756E-01	146.13
10 Lab 113	1.	<1.212E-02	95.00	1.301E 00	120.05
11 Lab 115/117	1.	2.633E-01	245.03	1.271E 00	123.01
12 Lab 115/117	1.	<1.212E-02	95.00	1.626E 00	103.73
13 Lab 115/117	1.	<1.212E-02	95.00	1.951E 00	92.41
14 Lab 115/117	1.	2.633E-01	245.03	9.453E-01	150.95
15 Lab 119	1.	2.633E-01	245.03	1.271E 00	123.01
16 Lab 119	1.	<1.212E-02	95.00	9.756E-01	146.13
17 Lab 122	1.	2.633E-01	245.03	9.453E-01	150.95
18 Lab 122	1.	2.623E-01	246.01	2.927E 00	72.24
19 Lab 128	1.	<1.212E-02	95.00	2.602E 00	77.49
20 Lab 128	1.	<1.212E-02	95.00	<1.721E 00	95.00

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % E[illegible] 95[illegible]
25 Lab 137	1.	<1.212E-02	95.00	3.252E 00	67.90
26 Lab 137	1.	<1.212E-02	95.00	1.431E 01	30.21
27 Lab 139	1.	<1.212E-02	95.00	1.951E 00	92.41
28 Lab 139	1.	<1.212E-02	95.00	<1.721E 00	95.00
29 Lab 141	1.	<1.212E-02	95.00	1.626E 00	103.73
30 Lab 141	1.	<1.212E-02	95.00	1.626E 00	103.73
31 Lab 141	1.	<1.212E-02	95.00	1.951E 00	92.41
32 Lab 141	1.	1.251E 00	103.16	2.480E 00	81.42
33 Lab 143	1.	2.618E-01	246.46	4.553E 00	56.00
34 Lab 143	1.	2.633E-01	245.03	2.246E 00	85.19
35 Lab 143	1.	<1.212E-02	95.00	1.301E 00	120.05
36 Lab 143	1.	<1.212E-02	95.00	1.951E 00	9[illegible]
37 Lab 145	1.	<1.212E-02	95.00	1.301E 00	120.05
38 Lab 145	1.	<1.212E-02	95.00	1.626E 00	103.73
39 Lab 145	1.	<1.212E-02	95.00	1.626E 00	103.73
40 Lab 145	1.	5.925E-01	154.00	9.150E-01	156.08
41 Lab 147	1.	<1.212E-02	95.00	1.301E 00	120.05
42 Lab 147	1.	<1.212E-02	95.00	2.602E 00	77.49
43 Lab 149	1.	<1.212E-02	95.00	<1.721E 00	95.00
44 Lab 149	1.	<1.212E-02	95.00	1.301E 00	120.05
45 Lab 151	1.	<1.212E-02	95.00	9.756E-01	146.13
46 Lab 151	1.	<1.212E-02	95.00	1.626E 00	103.73
47 Lab 154	1.	<1.212E-02	95.00	1.301E 00	120.05
48 Lab 154	1.	<1.212E-02	95.00	1.626E 00	103.73

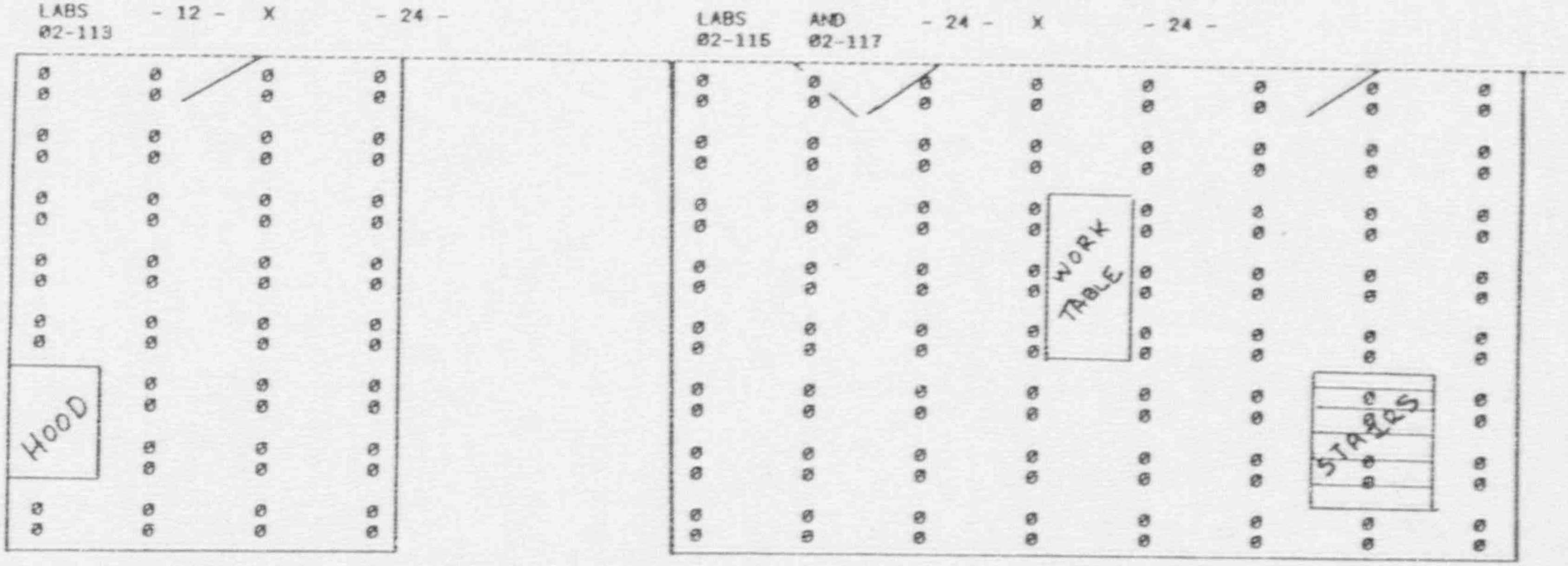
NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIE[illegible]

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
49 Lab 154	1.	2.633E-01	245.03	1.596E 00	105.77
50 Lab 154	1.	<1.212E-02	95.00	9.756E-01	146.13
AVERAGE		9.367E-02		1.890E 00	

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

ATTACHMENT 7: FINAL SURVEYS LABS 113, 115/117

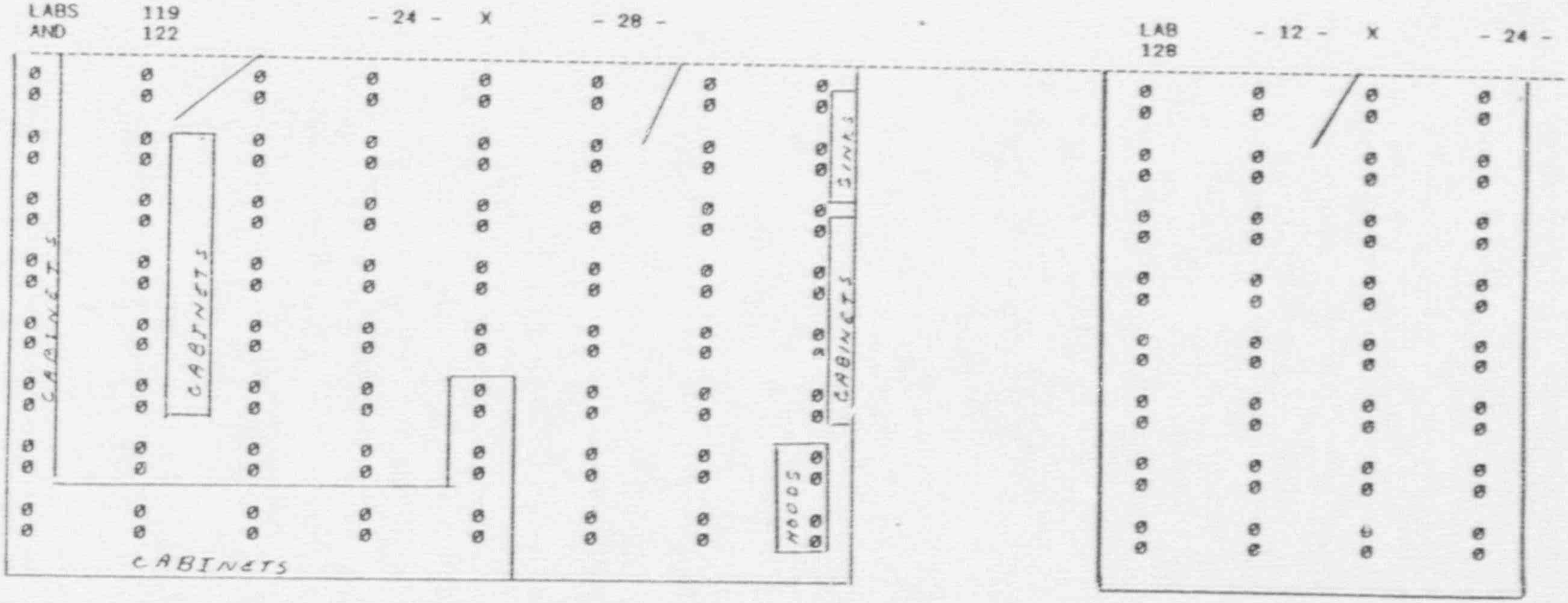


LAB 02-113 COMPLETED NOV. 3, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

LAB 02-115/117 COMPLETED OCT. 6, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. 115 MEZZANINE (408 SQUARE FEET) HAD NO DETECTABLE CONTAMINATION.

ATTACHMENT 8: FINAL SURVEYS
LABS 119/122, AND 128



LAB 02-119/122 COMPLETED NOV. 4, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

LAB 02-128 COMPLETED NOV 4, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. 119 MEZZANINE (448 SQUARE FEET) HAD NO DETECTABLE CONTAMINATION.

ATTACHMENT 9: INITIAL AND FINAL SURVEY LAB 141

INITIAL SURVEY	- 12 -	X	- 24 -
80 80	80 80	100 80	80 80
80 80	80 80	100 80	80 80
80 80	80 80	80 60	80 80
80 60	80 60	80 60	100 80
80 60	80 60	80 60	100 80
80 80	80 60	80 60	80 80
100 80	100 80	100 80	80 60
80 80	80 80	80 80	80 60

Sink

500

1500

3000

FINAL SURVEY	- 12 -	X	- 24 -
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

Sink

Hood Removed

INITIAL SURVEY COMPLETED OCT. 21, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87
ALL VALUES ARE IN COUNTS PER MINUTE
BACKGROUND READING 80 PLUS OR MINUS 20 CPM

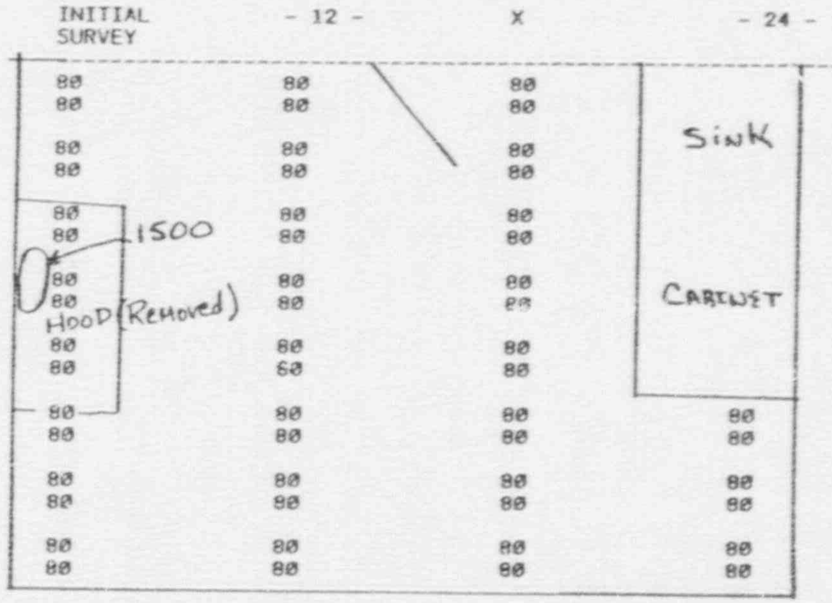
FINAL SURVEY COMPLETED NOV. 6, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

FINAL SURVEY NOTES:

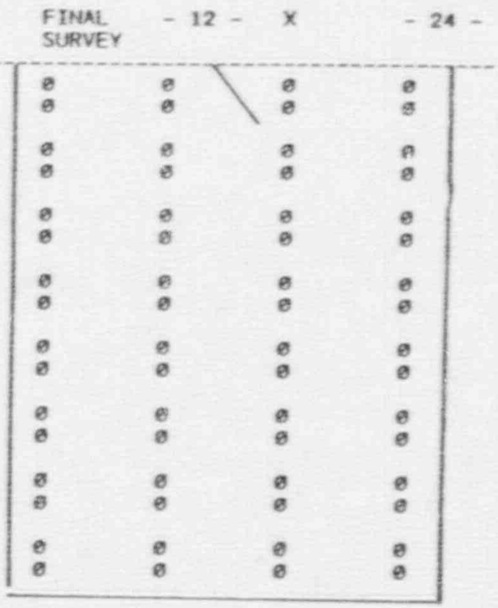
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

↑
N

ATTACHMENT 10: INITIAL AND FINAL SURVEY LAB 143



80	80	80	
80	80	80	
80	80	80	
80	80	80	
80	80	80	
80	80	80	
80	80	80	
80	80	80	
80	80	80	
80	60	80	
80	80	80	80
80	80	80	80
80	80	80	80
80	80	80	80
80	80	80	80
80	80	80	80



0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

INITIAL SURVEY COMPLETED OCT. 10, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87
ALL VALUES ARE IN COUNTS PER MINUTE
BACKGROUND READING 80 PLUS OR MINUS 20 CPM

FINAL SURVEY COMPLETED OCT. 26, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

INITIAL SURVEY NOTES:

HOOD VENTED TO CAUSTIC CABINET LEAKED ONTO FLOOR VENT AND PIPES ON THE WALL AND FLOOR. ALL OF THESE AREAS ARE CONTAMINATED TO 1500 CPM. THE CAUSTIC SOLUTION WAS DRAINED INTO A LIQUID WASTE CONTAINER. PIPES ON THE WALL AND ABOUT ONE SQUARE FOOT OF WALL SURFACE WERE DECONTAMINATED TO MEET RELEASE LIMITS.

FINAL SURVEY NOTES:

1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

N

ATTACHMENT 11: INITIAL AND FINAL SURVEY LAB 145

INITIAL SURVEY	- 12 -	X	- 24 -
80 80	80 80	80 80	80 80
80 80	80 80	80 80	80 80
80 80	80 80	80 80	80 80
80 80	80 80	80 80	100 80
80 80	80 80	80 80	100 80
80 80	80 80	80 80	100 80
80 80	80 80	80 80	100 90
80 80	80 80	90 80	80 80

1000 (plus pipes & WALL)

FINAL SURVEY	- 12	X	- 24 -
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

sink

HOOD REMOVED

INITIAL SURVEY COMPLETED OCT. 18, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87
ALL VALUES ARE IN COUNTS PER MINUTE
BACKGROUND READING 80 PLUS OR MINUS 20 CPM

FINAL SURVEY COMPLETED OCT. 23, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

FINAL SURVEY NOTES:

1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

N

ATTACHMENT_12 8R x 14C

18-NOV-87 9:48 Page 1

ATTACHMENT 12: FINAL SURVEY LABS 14', 149 AND 164

LAB 02-147 - 12 - X - 24 -

0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

LAB 02-149 - 12 - X - 24 -

0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

LAB 02-164 - 16 - X - 24 -

0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0

LABS 147, 149 AND 164 COMPLETED NOV. 9, 1987
USING GM COUNTER (TBM-28 #92238) CALIBRATED NOV. 9, 1987

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

↑
N

GA Technologies

GA Technologies Inc.
PO BOX 85608
SAN DIEGO, CALIFORNIA 92138
(619) 455-3000

RECEIVED
NRC
REGION V

1988 JAN 20 A 10:26

January 19, 1988
696-1163

Mr. Robert D. Thomas
Chief of Nuclear Materials Safety Section
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596-5368

Subject: Docket 70-734: SNM-696; Request for Release to Unrestricted Use - Revised Final Report

Reference: GA Technologies Inc. Letter 696-1146 dated November 18, 1987, Subject: Request for Release to Unrestricted Use

Dear Mr. Thomas:

During October and November of 1987, GA decontaminated a number of laboratories (20) on the lower floor of the Laboratory B section of Building 2. GA does not plan to conduct any future activities involving radioactive materials in the laboratories. Accordingly, GA requested the release of these laboratories in our November 18, 1987 letter (referenced above), and a final report summarizing the results of GA's survey was submitted to the NRC and the State of California.

Subsequently, GA decontaminated five additional laboratories. Three of these laboratories are located in the Laboratory B section of Building 2 (labs 130, 132 and 134), and the two laboratories are located in the Laboratory A section of Building 2 (labs 641 and 643).

In addition to these labs, GA decontaminated two areas in the service core area of Building 2, which had been contaminated during the handling of liquid wastes. Contaminated concrete and soil was removed from the area behind lab 331 and a contaminated floor drain and pipe was removed from the area behind lab 361. Since holes resulted in the service core area as a result of this effort, GA requested the NRC to survey these locations during their visit prior to GA backfilling the holes. This would give the NRC the opportunity to collect soil samples and survey the area prior to refurbishment.

Since GA is planning to lease these labs to outside companies, we requested the NRC to conduct a confirmatory survey of these labs in addition to the labs requested in our November 18, 1987, letter.

10955 JOHN JAY HOPKINS DR. SAN DIEGO, CALIFORNIA 92121

On December 14-16, 1987, B. Thomas and D. Skov conducted a confirmatory survey of all 25 laboratories and the two areas in the service core area. K. Wong from the State of California also conducted a confirmatory survey on December 17.

Enclosed is a revised final report describing all areas and summarizing the results of GA's surveys. This revised final report supersedes the report dated November 18, 1987. This report was revised to include five more laboratories, a brief history of activities involving radioactive materials for each of the 25 laboratories over the past 20 years, and surveys and soil sample results for two areas in the Building 2 service core. For completeness, the findings of the NRC and State confirmatory survey and GA's subsequent action are also included in this revised report.

We appreciate your attention to the above matter. If you have any questions regarding this report, please call Laura Quintana at (619) 455-2758.

Very truly yours,

Laura R. Quintana for
Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

KEA/mk
Enclosure
cc: Mr. Kim Wong
State of California

RECEIVED
NRC
REGION V

1988 JAN 20 A 10:26

DECONTAMINATION OF SELECTED GA TECHNOLOGIES' SCIENCE LABORATORIES FOR RELEASE TO UNRESTRICTED USE

REVISED

JANUARY 18, 1988

TABLE OF CONTENTS

LIST OF ATTACHMENTS

INTRODUCTION

During October, November and December 1987, GA Technologies Inc. decontaminated a number of laboratories in Building 2 (also known as the Science Laboratories Building).

GA has no plans for conducting any future activities involving radioactive materials in these laboratories and would like to lease them to outside companies. The offices across the hall from these laboratories which have never been used for work involving radioactive materials may also be leased to outside companies. Accordingly, GA is requesting the release of these laboratories and their associated offices to unrestricted use. The outside companies may use radioactive materials in the laboratories but would do so under their own Radioactive Materials License.

A total of twenty-five (25) laboratories will be leased to outside companies. Five (5) of these laboratories have never been used for work involving radioactive materials. A brief history of the use of the other 20 laboratories in the past twenty (20) years is provided. Only six (6) of the laboratories required decontamination beyond the removal of sources and contaminated equipment. These laboratories represent a total of 1776 ft^2 (not including mezzanines). The decontamination effort involved washing of floors, removal of floor tiles and the scabbling of about 12 ft^2 of concrete.

GA has decontaminated equipment and facilities consistent with the State of California's and U. S. Nuclear Regulatory Commission's guidelines for Release of Facilities and Equipment to Unrestricted Use.

In addition to the laboratories, we requested the State of California and the Nuclear Regulatory Commission to conduct a confirmatory survey of two locations in service core area of Building 2 which had been contaminated during past handling of liquid waste. These two locations are not located in the same section of Building 2 as the labs being release to unrestricted use. However, the NRC and State of California were asked to conduct a confirmatory survey of these areas because some concrete, and/or underground piping and soil had been removed and the holes created by this needed to be backfilled.

In one of the two locations (service core behind lab 331) the exposed soil was found to be contaminated and soil was removed until the residual met the criteria approved by the U. S. Nuclear Regulatory Commission (NRC) and endorsed by the Department of Health Services for application at GA's site. These criteria for releasing soil to unrestricted use are summarized in Tables 2 and 3 of Reference 1 (see Attachments 4C and 4D, respectively). Soil samples were collected and analyzed after cleanup in order to demonstrate compliance with the soil criteria.

The results of the analyses of these samples and the results of the final radiation and contamination surveys are included in this report to demonstrate compliance.

SITE DESCRIPTION

The location of Building 2 with respect to other facilities on the GA Site is shown in Attachment 1. A layout of the Building 2 is shown in Attachment 2. The building is divided into three Laboratory sections; Laboratory B, C, and A. Laboratory B includes offices and laboratories from 102 through 243. Laboratory C includes offices and laboratories from 300 through 445 and Laboratory A includes offices and laboratories from 502 through 651. The laboratories (with the exception of labs 641/643) which will be released to unrestricted use are located in the lower floor of the Laboratory B section and are shown in Attachment 3. The laboratories (25) are 102, 104, 107, 109, 111, 113, 115, 117, 119, 122, 128, 130, 132, 134, 137, 139, 141, 143, 145, 147, 149, 151, 154, 641 and 643. Laboratories 109/111, 115/117, 119/122, 130/132/134, and 641/643 are combined labs. Laboratories 641/643 are located in the Laboratory A section of Building 2 (see Attachment 2).

Six laboratories (115/117, 119/122 and 641/643) have mezzanines.

There was no known use of radioactive materials in the 115/117 mezzanine. The mezzanine in lab 119/122 had a storage cabinet which contained only sealed sources which were transferred to a new location. The mezzanine in lab 641/643 also contained some radioactive materials.

The total area of the twenty-five (25) labs is 10,115 ft^2 including the mezzanines. Of this, only 1776 ft^2 required decontamination other than the removal of sources and/or the removal or decontamination of equipment or cabinets. These were laboratories 115/117, and 141, 143, 145 and 643. The decontamination required surface cleaning of the floors in 115/117, and cleaning or removal of contaminated floor tiles in laboratories 141, 143, 145 and 643. In addition, about 15 ft^2 total area of concrete was scabbled in labs 141, 143, and 144.

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Equipment and Facilities

Table I (Attachment 4) is taken from USNRC's criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into our SNM-696 license. The State of California's limits for release of facilities and equipment to unrestricted use are identical to these limits for the radionuclides of concern (predominantly U-238, Cs-137, U-235 and Co-60). These guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," are also known as "DECON-1". GA has decontaminated the laboratories below the limits specified in both these Tables.

Soil Criteria

The criteria for soil decontamination is given in Tables 2 and 3 (Attachments 4C and 4D, respectively). These criteria have been previously approved by the NRC for use at the GA site and were approved by the Department of Health Services in Reference 2. Table 3 provides soil concentrations in pCi/g which if residing on the surface and inhaled would not lead to an exposure exceeding the target criteria specified in Table 2 (Attachment 4C).

Soil exposed after the removal of concrete in the two localized areas in the service core area of Building 2 was analyzed by gamma spectroscopy to determine the radioactive concentrations of the various isotopes. If the levels were above the soil criteria summarized in Table 3, soil was removed until these levels were met.

The collection, preparation, analysis and results of these soil samples are as follows:

> Surface soil samples were collected at each area where soil was exposed. The soil samples were dried to remove moisture. The samples were crushed and mixed to eliminate clumping and to homogenize the sample. the soil samples were then analyzed by gamma ray spectroscopy using a high purity germanium detector system in accordance with written procedures. All gamma emitting radionuclides were identified and their concentrations were determined.

INSTRUMENTATION AND MEASUREMENT LIMITS FOR RELEASE

Instrumentation

1. Beta/gamma counters
   Model TBM 28 geiger counters manufactured by Technical Associates were used to survey surfaces for beta/gamma contamination. The instruments contain a pancake Geiger-Mueller (GM) detector which has a window thickness of less than 7 mg/cm^2. The instrument has three ranges covering from 0-50,000 counts per minute (cpm).

3. Gamma Detectors
   a. Model 19 microR meters with NaI scintillation detectors

manufactured by Ludlum Measurements Inc. were used in all locations. The instrument has three ranges from 0 - 5 mR/hr.

b. Gamma spectral analysis on selected samples were performed using a high purity germanium detector manufactured by Canberra Industries, Inc.

All portable instruments are calibrated using a nominal 30 curie Cs-137 source. The alpha/beta systems and the germanium detector system has been calibrated for various type of samples. This calibration is checked on a daily or weekly basis depending on usage.

Measurement Limits for Release

1. Background

A "standard" natural background was determined for each instrument and subtracted from the survey readings. The surface beta/gamma readings were completed using the TBM Model 28 GM counters which have a background concrete reading of 80 plus or minus 20 counts per minute.

2. Efficiency and Geometry corrections

Because of the different radionuclides found in these laboratories, (primarily Cs-137, Co-60, U-238 and U-235), an instrument efficiency calibration was not completed for every area. All locations found to have contamination above background levels were decontaminated to background levels. There were two exceptions. The hood in lab 130 was contaminated with Co-60. An instrument (geiger counter) was calibrated to determine the efficiency to Co-60 using a Co-60 spiked concrete standard traceable to NBS. The hood was then cleaned until the levels were below the limits for Co-60 (beta/gamma levels) specified in Table 1 (Attachments 4A and 4B). The concrete in the service core area behind lab 331 was contaminated with U-238. The geiger counter was calibrated using a U-238 concrete standard traceable to NBS. The concrete was then decontaminated by scabbling the surface until the levels were below the limits for U-238 specified in Table 1 (Attachments 4A and 4B).

PREVIOUS LABORATORY ACTIVITIES AND EFFORT OF DECONTAMINATION REQUIRED

A brief description of the previous use of these 25 laboratories is provided below as well as the total area of each.

Case 1: No History of Use of Radioactive Materials (Cursory survey Completed)

Five of these laboratories 102, 104, 107, 109, and 111 had never been used for work involving radioactive material. The approximate total area (ft^2) is as follows:

Laboratory	Area (ft^2)
102	344
104	252
107	324
102/104/107 Mezzanine	697
109/111	576
	2193 ft^2

A meter survey using a TBM-28 geiger counter and a microR meter was conducted in all of these laboratories. There was no radioactive material or contamination found. Wipe samples were also collected. No contamination was detected.

Case 2: Possible Use of Radioactive Material Prior to February 1968

There has not been any work involving radioactive materials in three these laboratories in the past 20 years. Records were not reviewed past this time. The three labs and the approximate total area (ft^2) are as follows:

Laboratory	Area (ft^2)
137	288
139	288
151	288
	864 ft^2

A survey using the GM counter and a microR meter was conducted. No radioactive material or contamination was detected.

Case 3: Radioactive Material Used in Laboratories Since February 1968

Records show that the following laboratories have been used for working with radioactive material in the past 20 years. The labs were primarily used for Research and Development. The labs and the area in ft^2 are provided below.

Laboratory	Area (Ft^2)
113	288
115/117	576
115/117 Mezzanine	408
119/122	672
119/122 Mezzanine	448
128	288
130/132/134	864
130/132/134 Mezzanine	570
141	288
143	288
145	288
147	288
149	288
154	384

641/643	672	
641/643 Mezzanine	448	
Total	7058	(with Mezzanines)

Laboratory 113 had been used in the past five years for Research and Development work. The Work Authorization allowed irradiated material transfer, handling, grinding, screening and densitometric determinations. Irradiated material as well as U-235, U-238 and Th-232 was allowed to be handled. All sources and contaminated equipment were removed from the lab. A survey was conducted using the GM geiger counter and mircoR meter; no contamination was detected. However, during the confirmatory survey completed by the NRC on December 15, 1987, a cabinet drawer and a lead brick were found to be contaminated (about 1000 counts per minute). These were removed by GA personnel.

Laboratories 119/122 were used by the Health Physics group to analyze samples for radioactivity. The samples normally contained low levels of radioactivity in the form of mixed fission products, mixed activation products, uranium and thorium. All radioactive liquids were collected in an approved container and transferred to the Waste Processing Facility for proper disposal. A hood and oven used to process samples have been cleaned. There was no contamination found on the counters including the mezzanine area. However, during the State of California confirmatory inspection on December 17, 1987, K. Wong found contamination in the cabinet below the hood, and subsequent contamination of about six square feet of floor tiles measuring about 7000 counts per minute. GA personnel removed the cabinet below the hood and the contaminated floor tiles. A subsequent survey by K. Wong showed no contamination.

Laboratory 128 was used for the same work as that conducted in lab 134 (described above) until about three (3) years ago. During the confirmatory survey conducted by the NRC on December

15, 1987, a wall section measuring about 1000 counts per minute was discovered by NRC and removed by GA personnel. A subsequent survey by the NRC inspectors showed no contamination.

Laboratory 130 of the combined lab 130/132/134 was used until 12/86. The Work Authorization prior to 12/86 allowed irradiated material transfer, handling, grinding, screening and densitometric determinations. Irradiated material as well as U-235, U-238 and Th-232 was allowed to be handled. Two caves containing irradiated samples were removed and the samples were disposed of as radioactive waste. Another cave inside the hood also containing irradiated samples and bricks were transferred to the Hot Cell Facility. There was equipment which was contaminated with radioactive material which was removed. The hood was cleared out and decontaminated. Gamma scans showed the predominant contaminant to be Co-60. An instrument calibrated for Co-60 was used to determine the amount of effort needed to clean the hood to meet the release limits for Co-60 provided in Table 1 (Attachments 4A and 4B). The final survey of the hood is provided in Attachment 13.

Laboratories 147, 149, 151 and 154 were used prior to 1982 and new concrete was poured in 1982 after flooding cause damage to the tile, concrete below and the walls of the laboratories due to a water main break. New tile has also been installed several times since their use. Surveys completed in these laboratories showed no contamination. Until January 1977, lab 147 was used for measuring the thermal and physical properties of irradiated carbon and graphite samples and unirradiated fuel particles. The lab also contained some X-ray diffraction equipment. Until February 1981, lab 149 was used primarily for the study of Cesium-134 and Cesium-137 diffusion in graphite. Until about January 1975, fuel kernel fabrication was conducted in lab 151. The Work Authorization allowed the use of fission products, U-235 (350 grams), Th-232 (1000 grams), and U-238 (1000 grams) in four labs including lab 151. From 1975 until March 1982, irradiated fuel particles were received in lab 154 for probe analysis.

Labs which needed decontamination in Case 3: (beyond the removal of sources and contaminated equipment)

115/117	576
141	288
143	288
144	288
643	336
	1776 ft^2 (Included in area above)

Laboratory 115/117 was used until recently for studies utilizing irradiated material, U-235, Th-232 and U-238. The laboratory contained contaminated equipment, hoods, ducts, ovens, etc. which were contaminated with mixed fission products. All of the equipment has been removed. There was some slight contamination of the floor which was removed by washing the floor. A detailed survey was conducted.

Laboratories 141, 143 and 145 had various uses involving radioactive materials. Various work authorizations allowed the measurement of Kr-85 diffusion through empty and filled tubes under GCFR conditions and adsortion isotherm studies. These laboratories required the most decontamination effort. The floors in 141, 143 and 145 required washing and in some cases the removal of floor tiles and a total of about 12 ft^2 of concrete was scabbled in these labs. The scabbling was required after contamination was detected under the hoods. All of the labs contained contaminated equipment and materials. In lab 141, six linear feet of piping from the walls had to be decontaminated and about 3.5 ft^2 area of concrete was scabbled. Lab 141 has been left with the scabbled concrete exposed and the original floor tile. Lab 143 had about six linear feet of pipes decontaminated and also and about a 2 ft^2 area of concrete was scabbled. In addition, about one ft^2 of wall was removed. Lab 145 had five linear feet of pipes decontaminated and about 2 ft^2 of concrete scabbled. The concrete in labs 143 and 145 have been reconstructed and a few new tiles has been placed in these areas. In all about 17 linear feet of pipes were decontaminated, one ft^2 of wall and 12 ft^2 area of concrete was scabbled. A fireproof cabinet panel beneath the hood measuring about 2000 counts per minute was discovered by the NRC during their confirmatory survey and was removed by GA personnel.

The laboratories 641/643 were used until recently for research and development of a procedure for pelletizing and sintering thorium oxide (ThO_2). Normal uranium and thorium were the principal radionuclides used for this research. Small amounts of U-235 were also authorized (<350 grams). In addition, a small amount of Pu-239 (<0.04 grams) and U-233 (<0.21 grams) were occasionally used. Lab 641 required only the removal of contaminated equipment. The lower floor of lab 643 required the removal of equipment and disposal of a hood as radioactive waste. About six feet square of tiles were disposed of as radioactive waste. The concrete was washed and then surveyed. No contamination was detected. The mezzanine above lab 643 had one depleted fuel rod and many irradiated mettalographic samples. The NRC also found a counter top on December 14, 1987 contaminated to 30,000 counts per minute. The top covering was removed as well as the lower plywood section of the cabinet. The NRC resurveyed the area which was found to be clean.

SERVICE CORE AREAS

There were two locations in service core area shown in Attachment 2 which GA requested the NRC and State of California to survey. Soil samples were also collected by both agencies. One of the locations is behind lab 331 and the other location is behind lab 361.

Service Core Area behind Lab 331

Radioactive liquids in several laboratories in Building 2 were collected in 55 gallon drums for later treatment by the Waste Processing Facilities. One of these drums was located in the service core area behind lab 331 (see Page 1 of Attachment 15). During a routine survey of the service core area, some contamination was detected on the concrete near and underneath the drum. Apparently, the piping had leaked or the tubing leading to the drum disconnected resulting in the concrete becoming contaminated. The drum was removed and the area surveyed. The initial survey is provided in page 1 of Attachment 15. The highest contamination was located on the concrete beside the drum. The contamination seeped between two concrete slabs and into the soil below. The concrete was removed and disposed of as radioactive waste and the contaminated soil below it was collected and gamma scanned to determine the contaminant(s). U-238 was the predominant radionuclide found to be present. Soil was removed until the residual met the release limits for soil provided in Attachments 4C and 4D. The concrete was scabbled (see page 1 of Attachment 15) until the release limits provided in Table 1 (Attachment 4A and 4B) were met. The initial and final soil sample results are provided in Attachment 16. The location of the final soil samples for the service core area behind Lab 331 presented in Attachment 16 are shown in page 2 of Attachment 15. These samples are labeled "N" for the north side of the hole and "S" for the south end of the hole. The final survey of the concrete is also provided in page 2 of Attachment 15.

Service Core area behind 361

Contamination was also detected in a floor drain located behind laboratory 361. The floor drain, concrete surrounding the floor drain and the pipe (several feet in length) connecting the drain to the sewage line were found to be contaminated and were removed by GA personnel. The sewage line itself was found not to be contaminated. The contaminants were U-238 and thorium. There were about five 55 gallon drums being stored in the area. Although it is not known how the contamination occurred, it is feasible that liquid waste was being transferred to a drum and some was spilled in the area during this process. It is also possible that the liquid waste was diverted into the floor drain inadvertently by someone working in or near this laboratory. GA does not allow the dumping of radioactive liquid wastes in any facility except the Waste Processing Facility (unless previously reviewed and approved by Health Physics), however since the facility has been in operation for many years (about 25 to 30 years), it is not possible to say with certainty that this did not occur. Another possibility is that a storage drum overflowed at some time in the past causing the contamination. The surrounding soil was collected and analyzed by gamma scan and found to be at natural background levels. The results of the analysis is provided in Attachment 16.

FINAL CONTAMINATION SURVEYS

Contamination surveys were conducted in the laboratories although the floors had been washed; which effectively eliminates the probability of removable contamination. The locations of the wipe samples collected in the laboratories are shown in Attachment 5 and the results are shown in Attachment 6. The wipe samples were counted in a calibrated low level alpha/beta/gamma counting system manufactured by Canberra Industries Inc. The contamination levels in every location were < 20 dpm/100 cm^2 area, and well below the Table 1 limits (Attachment 4) for removable contamination.

FINAL RADIATION SURVEYS

LABORATORIES

Final radiation surveys of the laboratories were conducted using the TBM-28 GM counters. The results of these surveys are shown in Attachments

7 through 14 as described below. All laboratories were decontaminated to the background radiation (80 cpm +/- 20 cpm) which explains the dpm value of zero in the final radiation surveys with the exception of a hood in Lab 130 which was decontaminated to meet the Table I levels for beta-gamma emitters (contamination was Co-60). Radiation levels above background levels are given in dpm/100 cm^2, both for the average (top value) in a 1 m^2 or less area and the maximum (bottom value) in a 100 cm^2 area. It can be seen that all values are below the Table I limits (Attachments 4A and 4B). The final surveys are presented in the Attachments as follows:

Attachment 7: Final Surveys LABS 113, 115/117
Attachment 8: Final Surveys LABS 119/122, 128
Attachment 9: Initial and Final Survey LAB 141
Attachment 10: Initial and Final Survey LAB 143
Attachment 11: Initial and Final Survey LAB 145
Attachment 12: Final Survey LABS 147, 149, 154
Attachment 13: Final Surveys LABS 130/132/134
Attachment 14: Final Survey LABS 641/643

A microR meter manufactured by Ludlum Measurements was also used to survey the laboratories. The measurements were all within normal background levels.

SERVICE CORE AREAS

The concrete floor area of the service core area behind Lab 331/333 was decontaminated to levels below the Table I limits for U-238. Page one of Attachment 15 provides the initial survey results and page two provides the final results after cleanup. All values in the final survey results were converted into dpm using efficiency factors for U-238. The soil contaminated with U-238 was removed until the residual met the soil criteria specified in Tables 2 and 3 (Attachments 4C and 4D). The contaminated concrete around the floor drain in the service core area behind Lab 361 was removed as well as the pipe. The soil samples collected in this location showed no contamination above natural background levels (Attachment 16).

A microR meter manufactured by Ludlum Measurements was also used to survey the holes in the service core. The measurements were all within normal background levels.

COMPLIANCE WITH THE TARGET CRITERIA

The laboratories were cleared of all radioactive material sources. Contaminated equipment was either decontaminated to natural background levels or disposed of as radioactive waste. All floors and concrete surfaces were also decontaminated to background levels and therefore meet the limits in Table 1 (Attachment 4A and 4B). The final surveys provided in this report demonstrate compliance with the criteria for release to unrestricted use.

The results of soil samples collected in both of the service core areas were well below the level specified in Tables 2 and 3 (Attachments 4C and 4D, respectively).

CONCLUSION

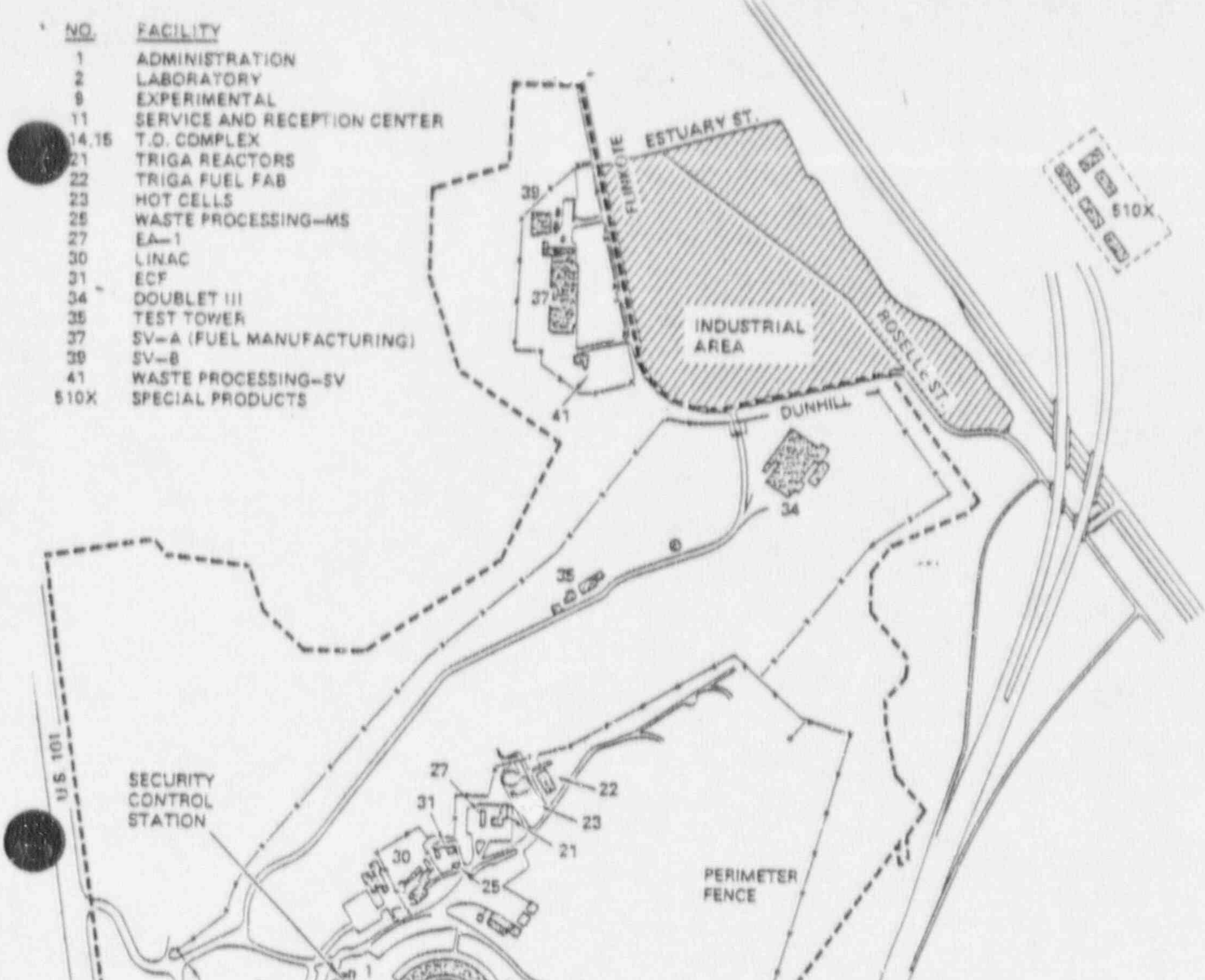
Twenty-five (25) Laboratories have been decontaminated for release to unrestricted use. Five (5) of the laboratories required decontamination beyond the removal of sources and contaminated equipment. Of these only about 15 ft^2 of concrete required scabbling. Items or locations identified by the NRC or the State of California as needing additional cleaning during their confirmatory surveys were cleaned immediately. The levels in all twenty-five laboratories are now well below the criteria for release to unrestricted use.

The two areas in the service core area also were cleaned below the limits for unrestricted use.

REFERENCES

1. Asmussen, Keith E., letter #CAL-1049 to Mr. Ben Kapel, "Decontamination of GA Technologies" Experimental Building," dated March 27, 1987.

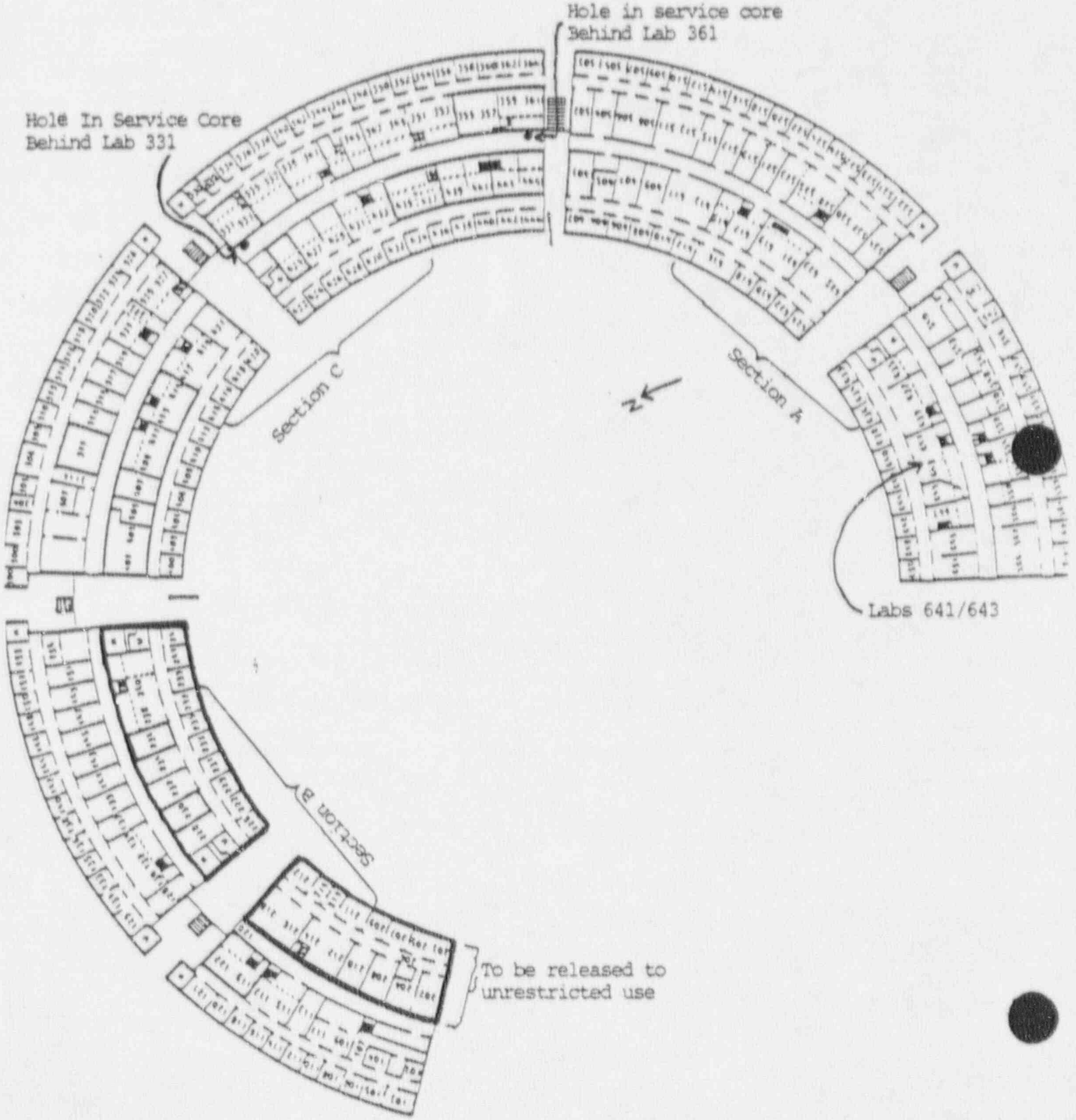
2. Kapel, Ben R., letter to Keith E. Asmussen dated May 14, 1987. Docket #033087-0145, containing amendment #86 to GA's radioactive material license number 0145-80.

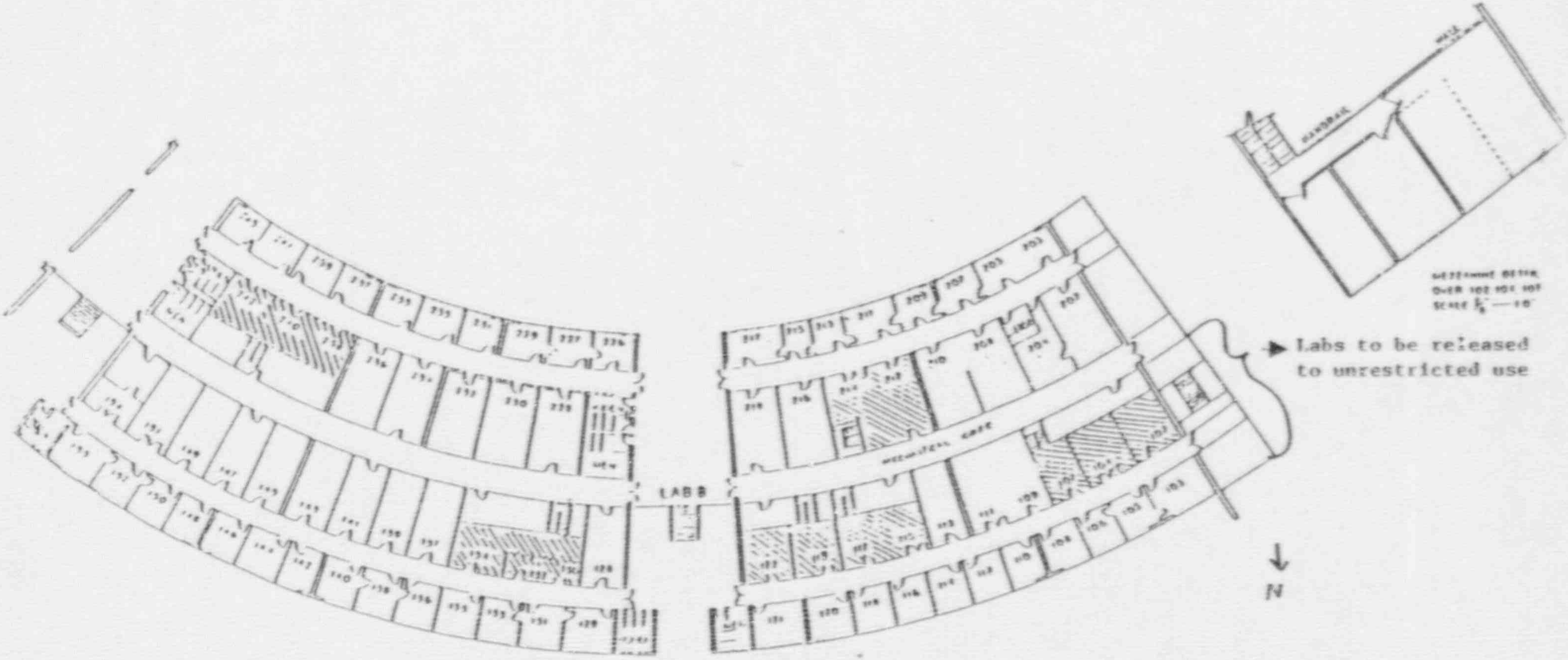


NO.	FACILITY
1	ADMINISTRATION
2	LABORATORY
9	EXPERIMENTAL
11	SERVICE AND RECEPTION CENTER
14,15	T.O. COMPLEX
21	TRIGA REACTORS
22	TRIGA FUEL FAB
23	HOT CELLS
25	WASTE PROCESSING—MS
27	EA—1
30	LINAC
31	ECF
34	DOUBLET III
35	TEST TOWER
37	SV—A (FUEL MANUFACTURING)
39	SV—B
41	WASTE PROCESSING—SV
510X	SPECIAL PRODUCTS

ATTACHMENT 1: PLAN VIEW OF SITE

ATTACHMENT 2: Building 2 Complex (Science Laboratories Building)





Labs to be released to unrestricted use

LABORATORY B
BUILDING 2

ATTACHMENT 3

ATTACHMENT 4A

TABLE I
ACCEPTABLE SURFACE CONTAMINATION LEVELS1/2/

NUCLIDE[a]	AVERAGE[b,c] (dpm/100 cm^2)	MAXIMUM[b,d] (dpm/100 cm^2)	REMOVABLE[b,e] (dpm/100 cm^2)
) U-nat, U-235, U-238, and associated decay products	5,000	15,000	1,000
) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231 Ac-227, I-125, I-129	100	300	20
) Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
) H-3, C-14 except as DNA precursors f/	20,000	60,000	4,000

here surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the lim[illegible] stablished for alpha- and beta-gamma-emitting nuclides should apply independently.

s used in this table, dpm (disintegrations per minute) means the rate of emission by radioactiv aterial as determined by correcting the counts per minute observed by an appropriate detector r background, efficiency, and geometric factors associated with the instrumentation.

easurements of average contaminant should not be averaged over more than 1 square meter. For bjects of less surface area, the average should be derived for each such object.

he maximum contamination level applies to an area of not more than 100 cm^2.

he amount of removable radioactive material per 100 cm^2 of surface area should be determined y wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and ssessing the amount of radioactive material on the wipe with an appropriate instrument of known fficiency. When removable contamination on objects of less surface area is determined, the ertinent levels should be reduced proportionally and the entire surface should be wiped.

NA precursors mean molecules or compounds that are directly incorporated into the DNA molecule uring DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and ucleosides. The acceptable surface contamination levels for H-3 and C-14 in DNA precursors re as tabulated in paragraph (d) for beta-gamma-emitters.

USNRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, Wash[illegible]n D.C. (June 1974)

ANSI, Control of Radioactive Surface Contamination on Materials, Equipment and Facilities To Be Released for Uncontrolled Use, final draft, proposed American National Standard N-328, Atomic Industrial Forum, Inc., N.Y. (June 1974)

Attachment 4B

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES[a]	AVERAGE[b c f]	MAXIMUM[b d f]	REMOVABLE[b e f]
nat, U-235, U-238, and sociated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
ansuranics, Ra-226, Ra-228, -230, Th-228, Pa-231, -227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
-nat, Th-232, Sr-90, -223, Ra-224, U-232, I-126, 131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
ta-gamma emitters (nuclides ith decay modes other than lpha emission or spontaneous ission) except Sr-90 and thers noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emittin nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm^2.

The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

TABLE 2

Criteria for Soil Decontamination at the GA Site

Exposure Pathway	Target Criteria	Other Existing Criteria or Guidance
External Radiation (whole body)	10 μr/hr (35 mrem/yr)(a)	20 μr/hr indoor(b)-EPA cleanup standard for Inactive Uranium Processing Site; 500 mrem/yr-10 CFR 20; 170 mrem/yr-FRC Guidance; 400-900 mrem/yr-Surgeon General's Guidance for indoor exposure; 25 mrem/yr-40 CFR 190.
Inhalation of Particulates (lung, bone)	1 mrad/yr (lung) (20 mrem/yr)(c) 3 mrad/yr (bone) (60 mrem/yr)	1500 mrem/yr-10 CFR 20(d) 25 mrem/yr-40 CFR 190 1 mrad/yr (lung), 3mrad (bone) EPA Transuranic Guidance

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(a) This value does not include background, the 35 mrem/yr (realistic dose) includes shielding factor of 0.5 from building a residential home for general population and residence time 80 percent.

(b) 40 CFR Part 192 - Federal Register, April 22, 1980.

(c) Based on quality factor of 20 as originally intended for alpha emitted from the transuranic elements.

(d) Designated in or derived from 10 CFR 20.

TABLE 3

Individual Concentration in Soil Resulting in an Annual Inhalation Dose of 20 mrem to the Lung(1) and 60 mrem to the Bone(2)

Radionuclide	Solubility Classification	Derived Concentration (pCi/g) Lung (20 mrem/yr)	Derived Concentration (pCi/g) Bone (60 mrem/yr)
U-238	Y	35	1.2×10^4
U-238	W	3.2×10^2	3.9×10^3
U-238	D	1.9×10^4	1.2×10^3
U-235	Y	35	1.2×10^4
U-235	W	3.2×10^2	3.9×10^3
U-235	D	1.9×10^4	1.2×10^3
U-234	Y	30	1.0×10^4
U-234	W	2.8×10^2	3.6×10^3
U-234	D	1.7×10^4	1.1×10^3
Th-232	Y	35	2.6×10
Th-232	W	3.3×10^2	1.0×10^2
Ra-228	W	3.3×10^3	2.9×10^3
Th-228[3]	Y	20	1.8×10^3
Th-228	W	1.3×10^2	3.3×10^2
Co-60[4]	Y	1.2×10^4	1.6×10^6
Co-60	W	1.2×10^5	5.8×10^6
Cs-137[4]	D	9.6×10^5	1.8×10^6
Sr-90[4]	Y	1.8×10^3	2.6×10^5
Sr-90	D	1.6×10^6	2.8×10^4

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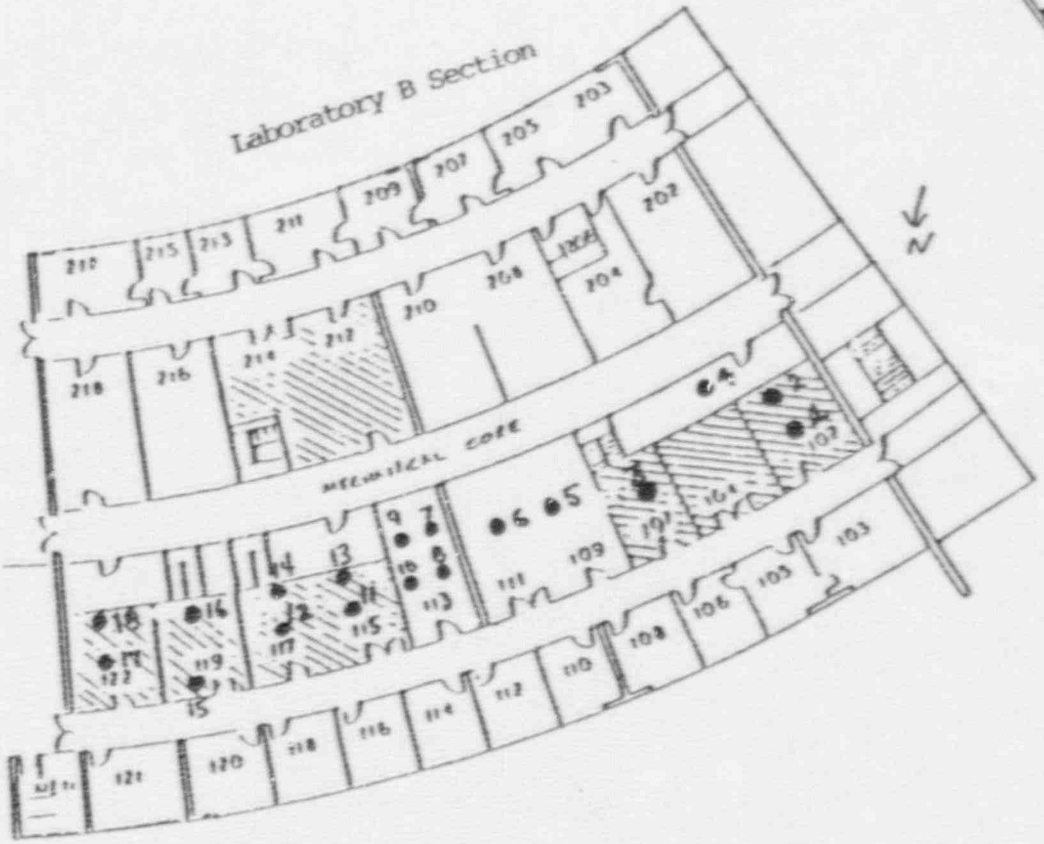
(1) Pulmonary lung (570 gm); consistent with EPA's Transuranic Guidance.

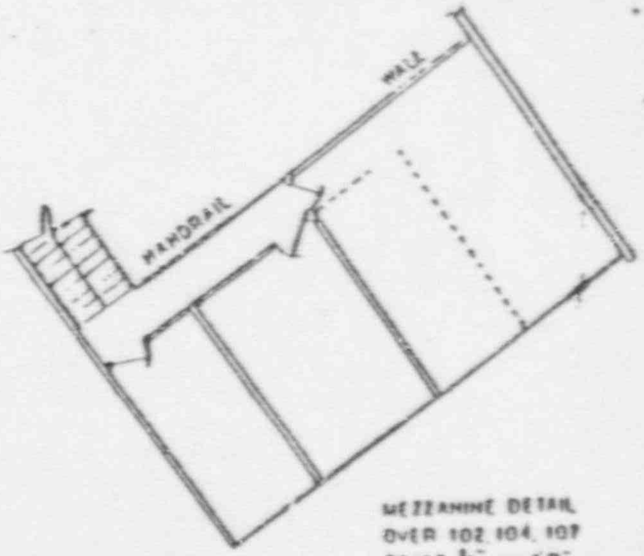
(2) Bone means osseous tissue (5,000 gm); consistent with EPA's Transuranic Guidance.

(3) The daughters of Th-228 and Ac-228 do not contribute significantly to the inhalation dose because of their comparatively short half-lives..

(4) Solubility classifications are based on ICRP-30.

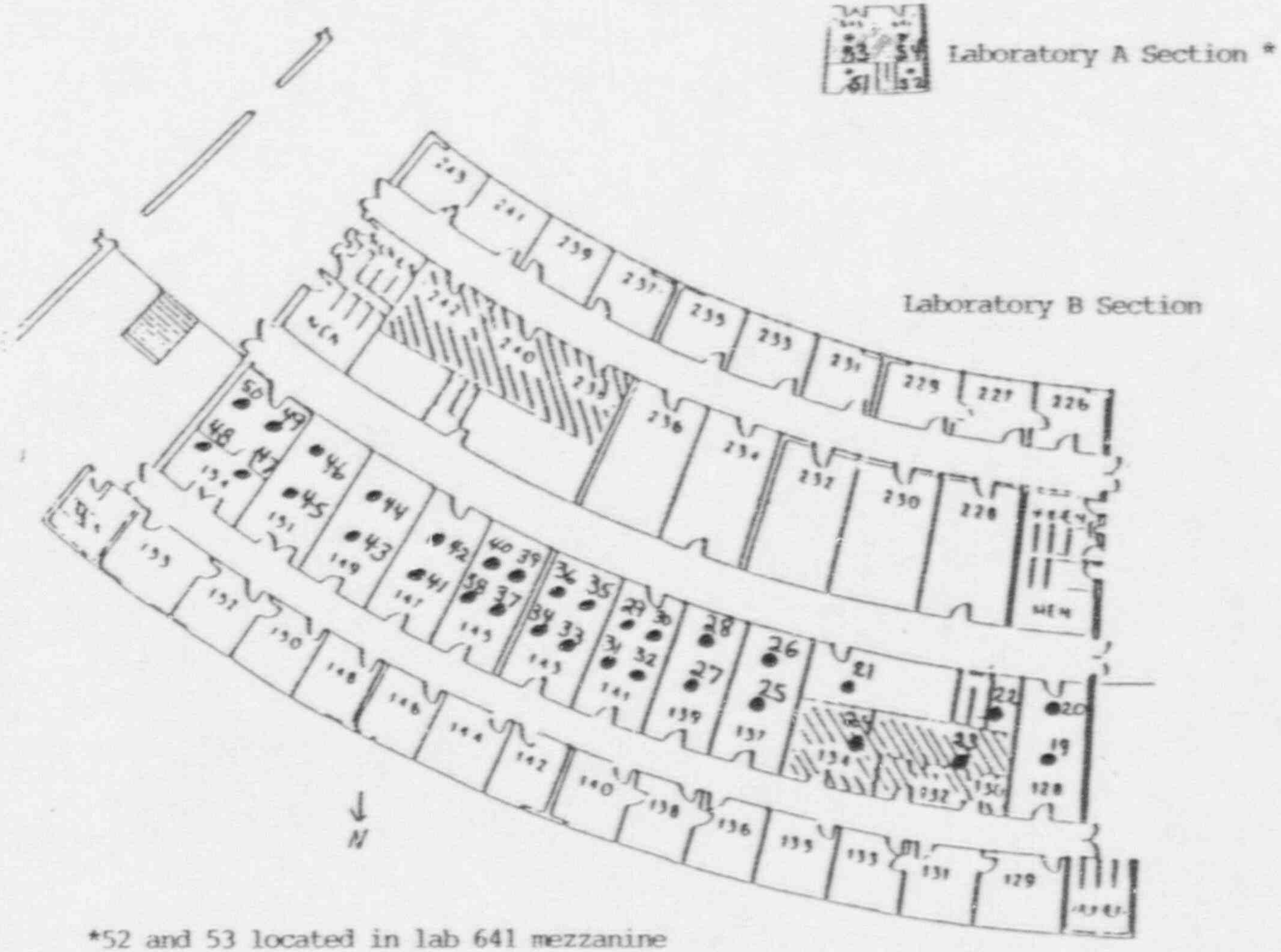
Laboratory B Section





MEZZANINE DETAIL
OVER 102, 104, 107
SCALE 1/8" — 1'0"

ATTACHMENT 5: CONTAMINATION SURVEY WIPE LOCATIONS



*52 and 53 located in lab 641 mezzanine

Attachment 6: Contamination Survey Results

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
BLDG 2 W-1 Lab102	1.	<1.212E-02	95.00	<1.252E 00	95.00
2 11/3/87 Lab 102	1.	<1.212E-02	95.00	<1.252E 00	95.00
3 Lab 104	1.	<1.212E-02	95.00	<1.252E 00	95.00
4 Lab 107	1.	<1.212E-02	95.00	<1.721E 00	95.00
5 Lab 109	1.	<1.212E-02	95.00	<1.252E 00	95.00
6 Lab 109/111	1.	<1.212E-02	95.00	9.756E-01	146.13
7 Lab 113	1.	<1.212E-02	95.00	1.626E 00	103.73
8 Lab 113	1.	<1.212E-02	95.00	<1.721E 00	95.00
9 Lab 113	1.	<1.212E-02	95.00	9.756E-01	146.13
10 Lab 113	1.	<1.212E-02	95.00	1.301E 00	120.[illegible]
11 Lab 115/117	1.	2.633E-01	245.03	1.271E 00	123.01
12 Lab 115/117	1.	<1.212E-02	95.00	1.626E 00	103.73
13 Lab 115/117	1.	<1.212E-02	95.00	1.951E 00	92.41
14 Lab 115/117	1.	2.633E-01	245.03	9.453E-01	150.95
15 Lab 119	1.	2.633E-01	245.03	1.271E 00	123.01
16 Lab 119	1.	<1.212E-02	95.00	9.756E-01	146.13
17 Lab 122	1.	2.633E-01	245.03	9.453E-01	150.95
18 Lab 122	1.	2.623E-01	246.01	2.927E 00	72.24
19 Lab 128	1.	<1.212E-02	95.00	2.602E 00	77.49
20 Lab 128	1.	<1.212E-02	95.00	<1.721E 00	95.00
21 Lab 134	1.	<1.212E-02	95.00	9.756E-01	146.13
22 Lab 130	1.	2.633E-01	245.03	9.453E-01	150.95
23 Lab 132 Mez	1.	<1.212E-02	95.00	2.602E 00	77.[illegible]
24 Lab 134 Mez	1.	<1.212E-02	95.00	9.756E-01	146.13

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
25 Lab 137	1.	<1.212E-02	95.00	3.252E 00	67.90
26 Lab 137	1.	<1.212E-02	95.00	1.431E 01	30.21
27 Lab 139	1.	<1.212E-02	95.00	1.951E 00	92.41
28 Lab 139	1.	<1.212E-02	95.00	<1.721E 00	95.00
29 Lab 141	1.	<1.212E-02	95.00	1.626E 00	103.73
30 Lab 141	1.	<1.212E-02	95.00	1.626E 00	103.73
31 Lab 141	1.	<1.212E-02	95.00	1.951E 00	92.41
32 Lab 141	1.	1.251E 00	103.16	2.480E 00	81.42
33 Lab 143	1.	2.618E-01	246.46	4.553E 00	56.00
34 Lab 143	1.	2.633E-01	245.03	2.246E 00	85.19
35 Lab 143	1.	<1.212E-02	95.00	1.301E 00	120.05
6 Lab 143	1.	<1.212E-02	95.00	1.951E 00	92.41
37 Lab 145	1.	<1.212E-02	95.00	1.301E 00	120.05
38 Lab 145	1.	<1.212E-02	95.00	1.626E 00	103.73
39 Lab 145	1.	<1.212E-02	95.00	1.626E 00	103.73
40 Lab 145	1.	5.925E-01	154.00	9.150E-01	156.08
41 Lab 147	1.	<1.212E-02	95.00	1.301E 00	120.05
42 Lab 147	1.	<1.212E-02	95.00	2.602E 00	77.49
43 Lab 149	1.	<1.212E-02	95.00	<1.721E 00	95.00
44 Lab 149	1.	<1.212E-02	95.00	1.301E 00	120.05
45 Lab 151	1.	<1.212E-02	95.00	9.756E-01	146.13
46 Lab 151	1.	<1.212E-02	95.00	1.626E 00	103.73
47 Lab 154	1.	<1.212E-02	95.00	1.301E 00	120.05
48 Lab 154	1.	<1.212E-02	95.00	1.626E 00	103.73

TE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

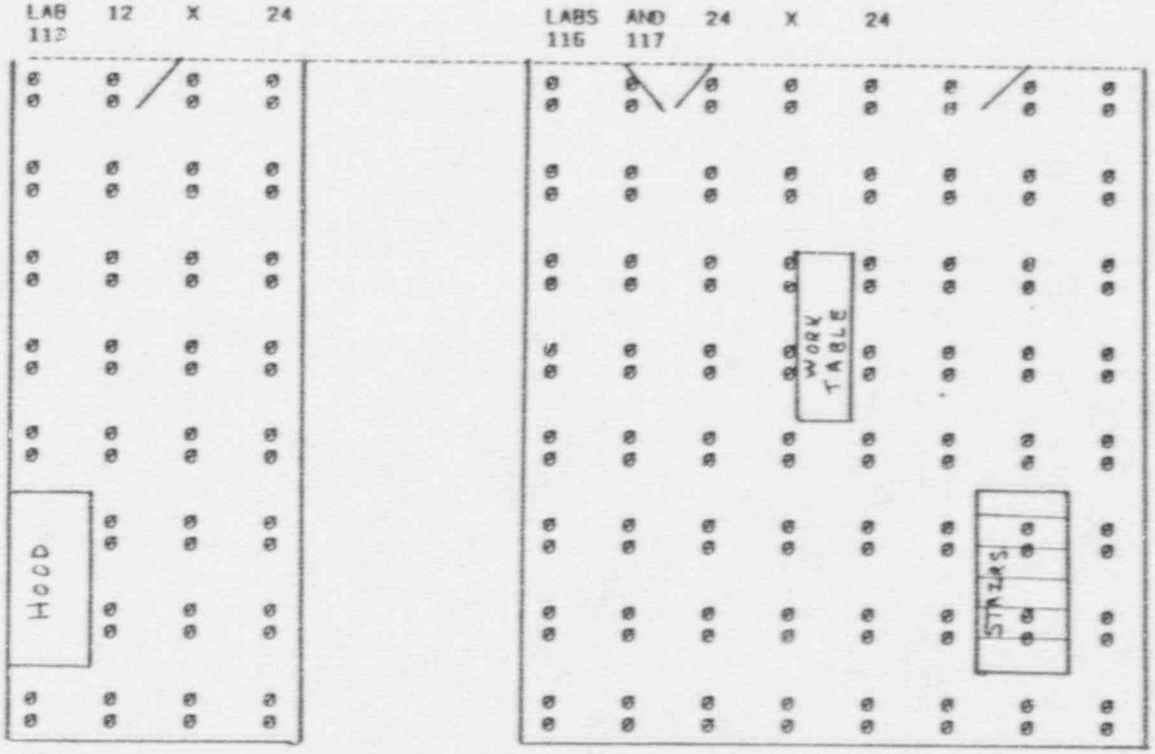
GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
49 Lab 154	1.	2.633E-01	245.03	1.596E 00	105.77
50 Lab 154	1.	<1.212E-02	95.00	9.756E-01	146.13
AVERAGE		9.367E-02		1.890E 00	
51 Lab 643	1.	<1.258E-02	95.00	<1.241E 00	95.00
52 Lab 641 Mez	1.	2.734E-01	245.03	<7.503E-01	95.00
53 Lab 643	1.	<1.258E-02	95.00	<3.751E-02	95.00
54 Lab 641 Mez	1.	<1.258E-02	95.00	<7.503E-01	95.00
		7.778E-02		6.948E-01	

NOTE! THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

JAN 1 4 1988

ATTACHMENT 7: FINAL SURVEYS LABS 113, 116/117 .

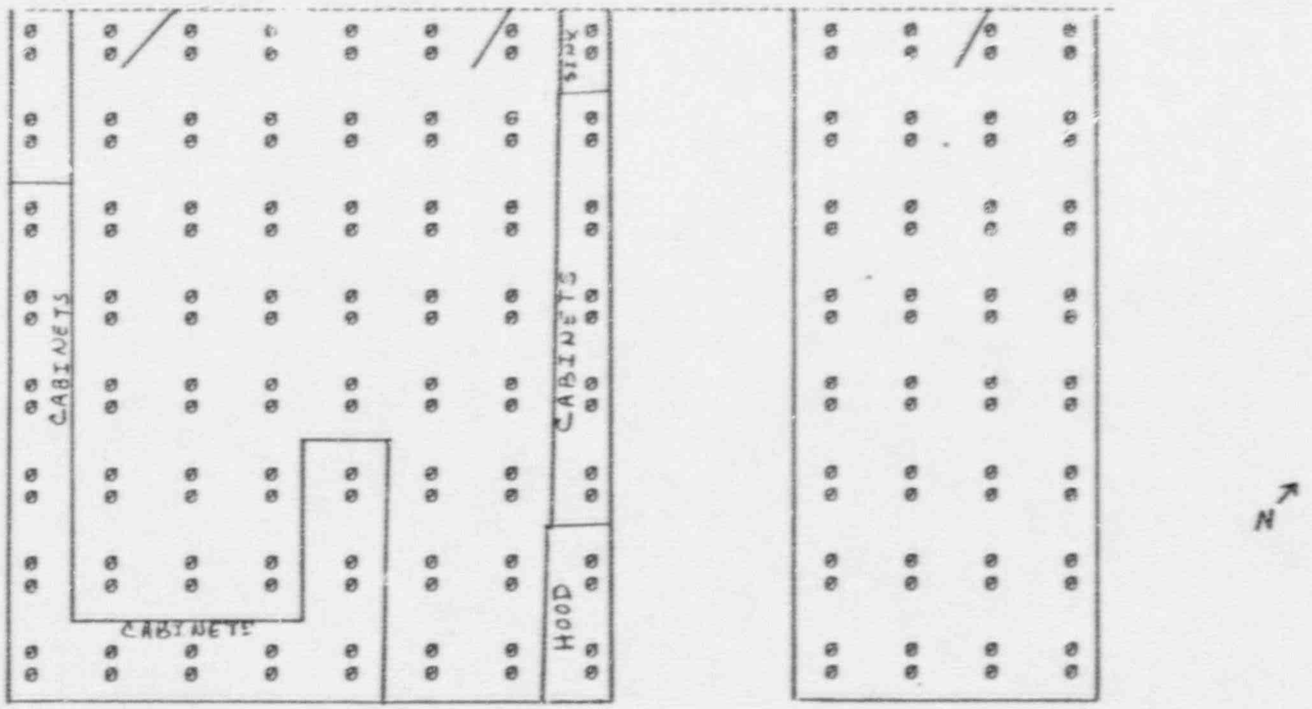


LAB 02-113 COMPLETED NOV. 3, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

LAB 02-116/117 COMPLETED OCT. 6, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. 115 MEZZANINE (400 SQUARE FEET) HAD NO DETECTABLE CONTAMINATION.

ATTACHMENT 8: FINAL SURVEYS
LABS 119/122, AND 128



LABS 119 - 24 X - 28
AND 122

0 0	0 0	0 0	6 6	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	6 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

LAB - 12 X - 24
128

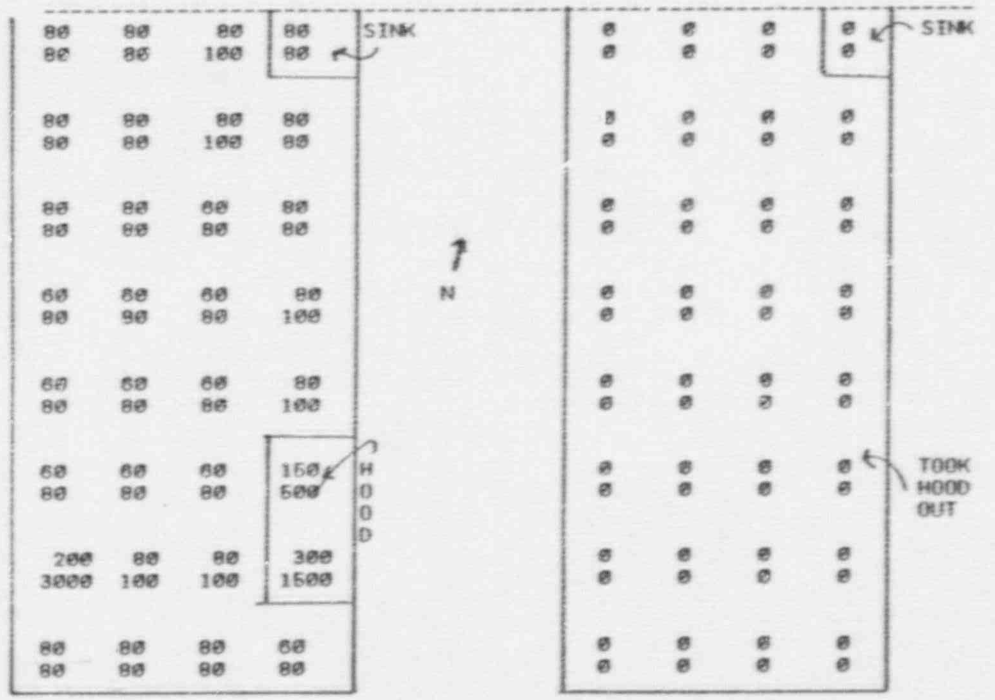
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

LAB 02-119/122 COMPLETED NOV. 4, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

LAB 02-128 COMPLETED NOV 4, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. 119 MEZZANINE (448 SQUARE FEET) HAD NO DETECTABLE CONTAMINATION.

ATTACHMENT 9: INITIAL AND FINAL SURVEY LAB 141



12 X 24

80 80	80 80	80 100	80 80
80 80	80 80	80 100	80 80
80 80	80 80	60 80	80 80
60 80	80 90	60 80	80 100
60 80	60 80	60 80	80 100
60 80	60 80	60 80	150 600
200 3000	80 100	80 100	300 1500
80 80	80 80	80 80	60 80

<u>INITIAL SURVEY</u>

12 X 24

0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

FINAL SURVEY

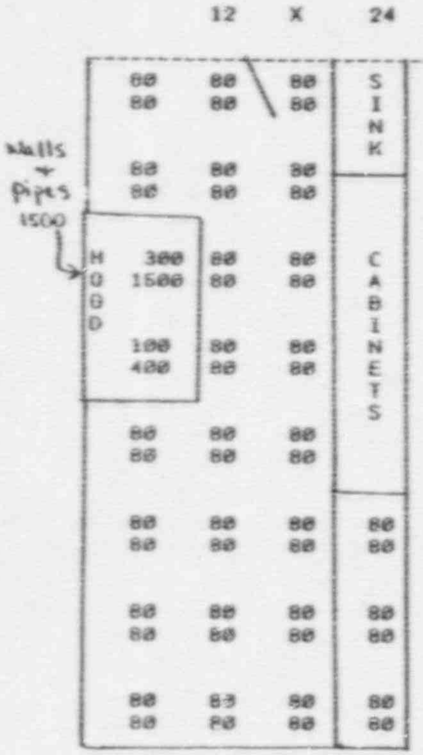
INITIAL SURVEY COMPLETED OCT. 21, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87
ALL VALUES ARE IN COUNTS PER MINUTE
BACKGROUND READING 80 PLUS OR MINUS 20 CPM

FINAL SURVEY COMPLETED NOV. 6, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

FINAL SURVEY NOTES:

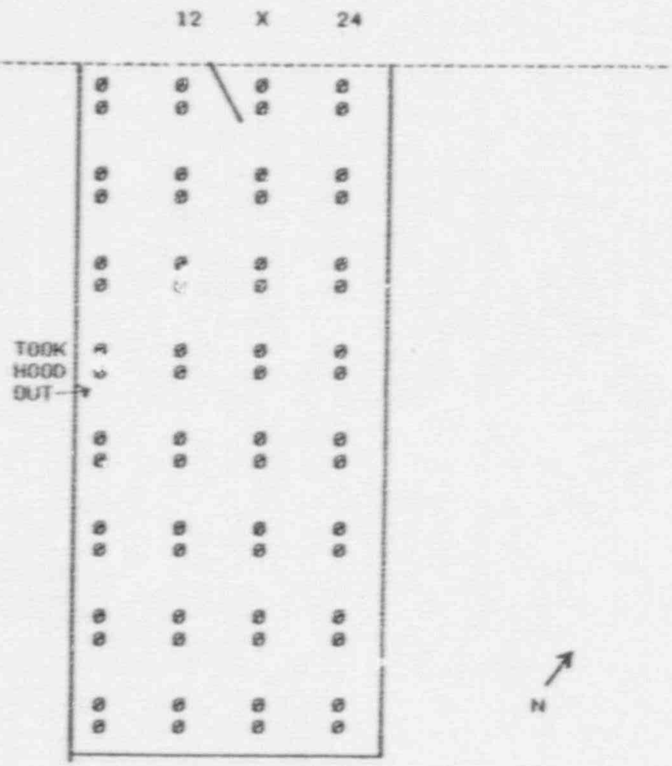
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

ATTACHMENT 10: INITIAL AND FINAL SURVEY LAB 143



80 80	80 80	80 80	SINK
80 80	80 80	80 80	
HOOD 300 1500	80 80	80 80	CABINETS
100 400	80 80	80 80	
80 80	80 80	80 80	
80 80	80 80	80 80	80 80
80 80	80 80	80 80	80 80
80 80	83 P0	80 80	80 80

INITIAL SURVEY



0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

FINAL SURVEY

INITIAL SURVEY COMPLETED OCT. 16, 1987
USING GM COUNTER (TBM-28 #2769) CALIBRATED 8/3/87

FINAL SURVEY COMPLETED OCT. 26, 1987
USING GM COUNTER (TBM-28 #2769) CALIBRATED 8/3/87

ALL VALUES ARE IN COUNTS PER MINUTE. BACKGROUND READING 80 PLUS OR MINUS 20 CPM

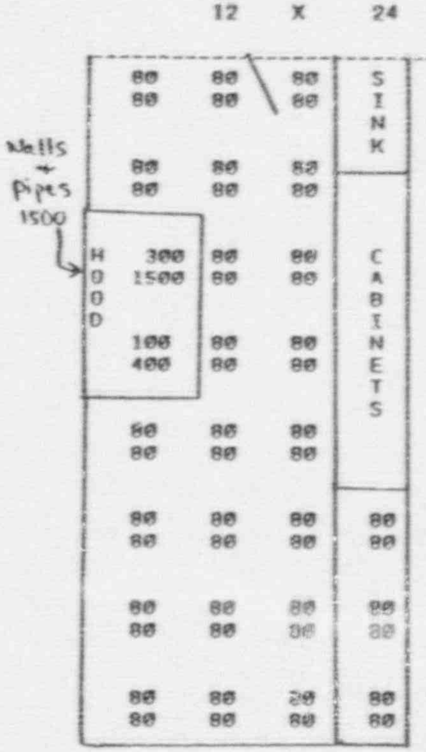
INITIAL SURVEY NOTES:

HOOD VENTED TO CAUSTIC CABINET LEAKED ONTO FLOOR VENT AND PIPES ON THE WALL AND FLOOR. ALL OF THESE AREAS ARE CONTAMINATED TO 1600 CPM. THE CAUSTIC SOLUTION WAS DRAINED INTO A LIQUID WASTE CONTAINER. PIPES ON THE WALL AND ABOUT ONE SQUARE FOOT OF WALL SURFACE WERE DECONTAMINATED TO MEET RELEASE LIMITS.

FINAL SURVEY NOTES:

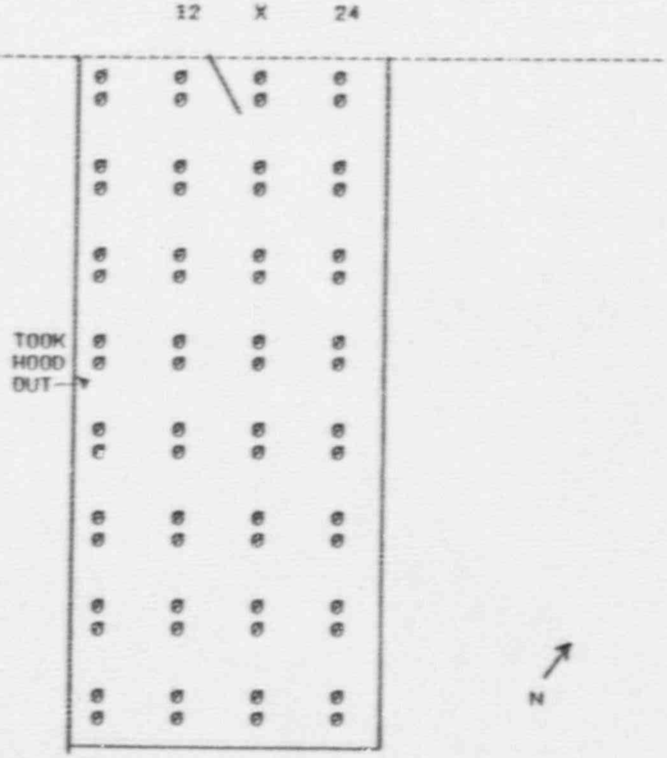
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

ATTACHMENT 10: INITIAL AND FINAL SURVEY LAB 143



80 80	80 80	80 80	SINK
80 80	80 80	80 80	CABINETS
300 1500	80 80	80 80	
100 400	80 80	80 80	
80 80	80 80	80 80	
80 80	80 80	80 80	80 80
80 80	80 80	80 80	80 80
80 80	80 80	20 80	80 80

INITIAL SURVEY



0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

FINAL SURVEY

INITIAL SURVEY COMPLETED OCT. 16, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

FINAL SURVEY COMPLETED OCT. 28, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

ALL VALUES ARE IN COUNTS PER MINUTE. BACKGROUND READING 80 PLUS OR MINUS 20 CPM

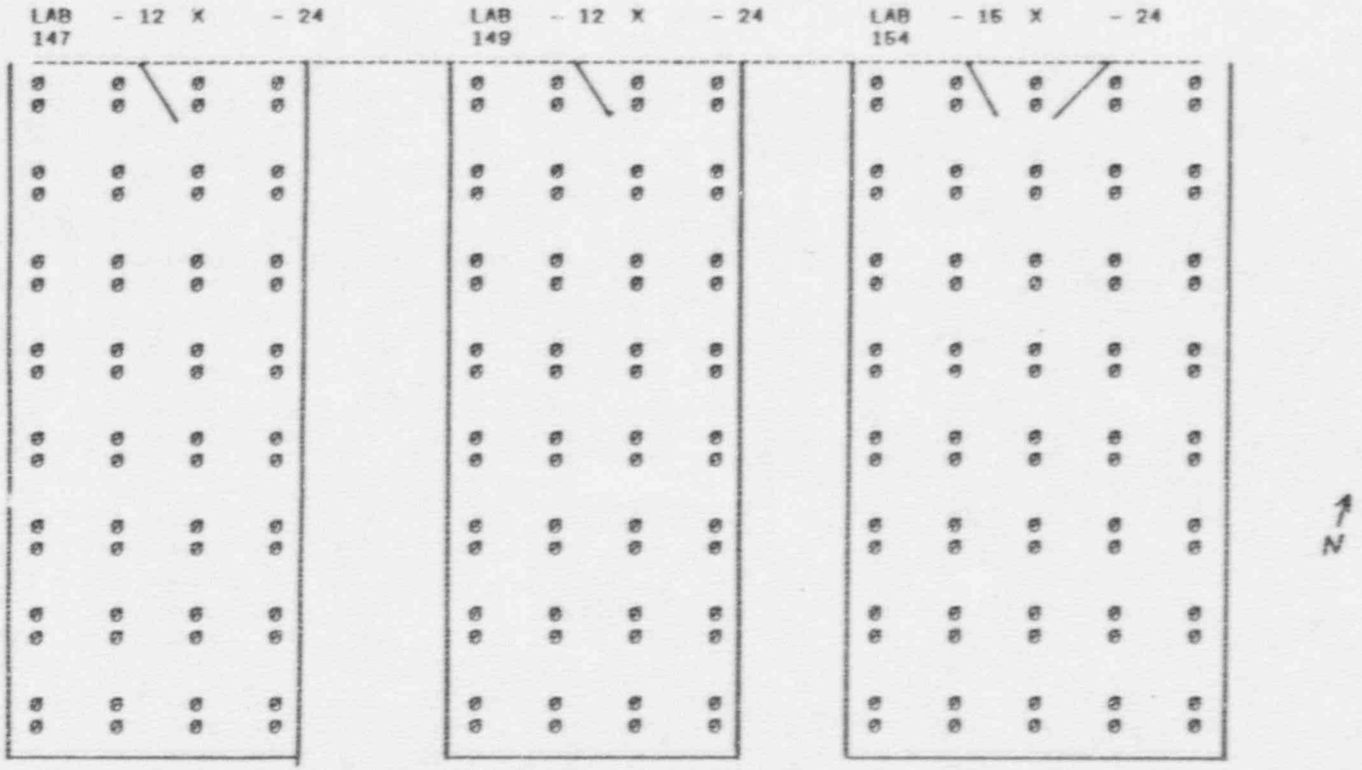
INITIAL SURVEY NOTES:

HOOD VENTED TO CAUSTIC CABINET LEAKED ONTO FLOOR VENT AND PIPES ON THE WALL AND FLOOR. ALL OF THESE AREAS ARE CONTAMINATED TO 1500 CPM. THE CAUSTIC SOLUTION WAS DRAINED INTO A LIQUID WASTE CONTAINER. PIPES ON THE WALL AND ABOUT ONE SQUARE FOOT OF WALL SURFACE WERE DECONTAMINATED TO MEET RELEASE LIMITS.

FINAL SURVEY NOTES:

1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

ATTACHMENT 12: FINAL SURVEY LABS 147, 149 AND 154



LAB 147 - 12 X - 24

0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

LAB 149 - 12 X - 24

0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

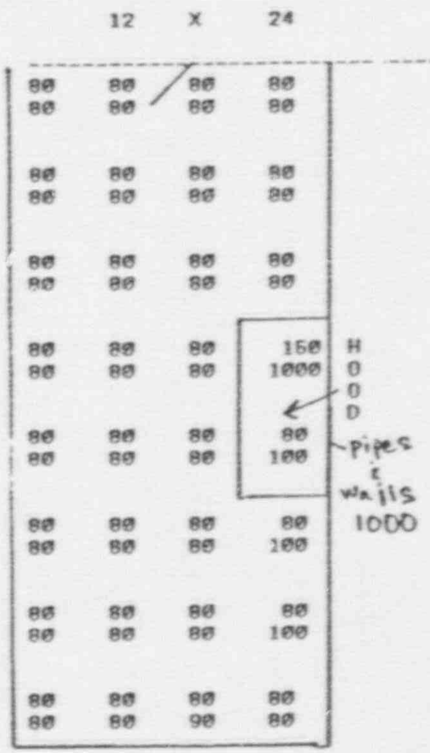
LAB 154 - 15 X - 24

0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0

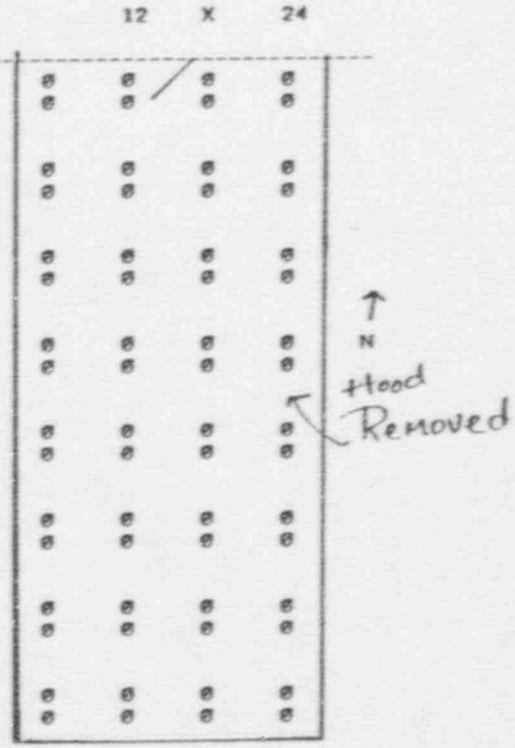
LABS 147, 149 AND 154 COMPLETED NOV. 9, 1987
USING GM COUNTER (TBM-28 #92238) CALIBRATED NOV. 9, 1987

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

ATTACHMENT 11: INITIAL AND FINAL SURVEY LAB 145



80 80	80 80	80 80	80 80
80 80	80 80	80 80	80 80
80 80	80 80	80 80	80 80
80 80	80 80	80 80	150 1000
80 80	80 80	80 80	80 100
80 80	80 80	80 80	80 100
80 80	80 80	80 80	80 100
80 80	80 80	80 90	80 80



0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

INITIAL SURVEY

FINAL SURVEY

INITIAL SURVEY COMPLETED OC[illegible]. [illegible]6, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87
ALL VALUES ARE IN COUNTS PER MINUTE
BACKGROUND READING 80 PLUS OR MINUS 20 CPM

FINAL SURVEY COMPLETED OCT. 23, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

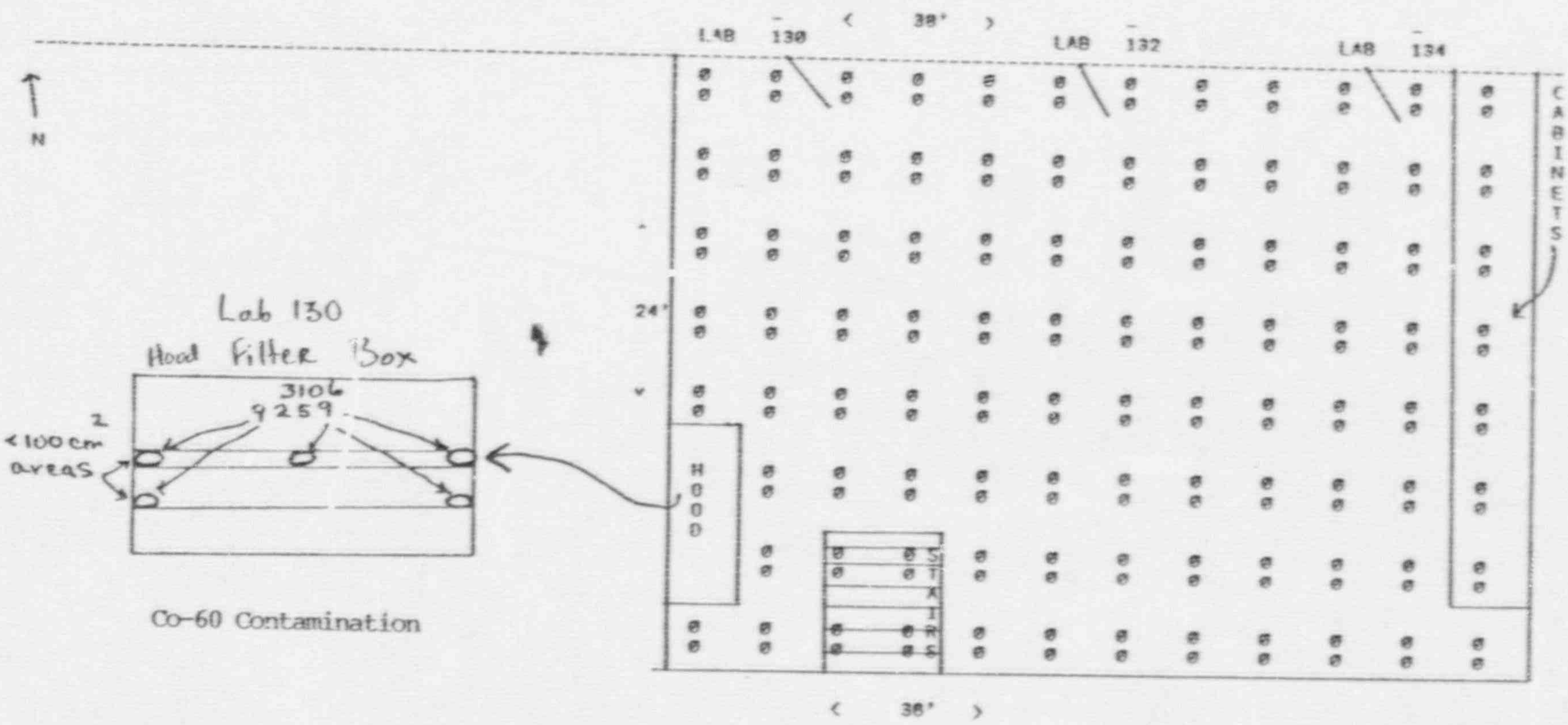
FINAL SURVEY NOTES:

1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

ATTACHMENT_13 9R x 25C

19-JAN-88 7:41 Page 1

FINAL SURVEY
LABS 132, 132 AND 134

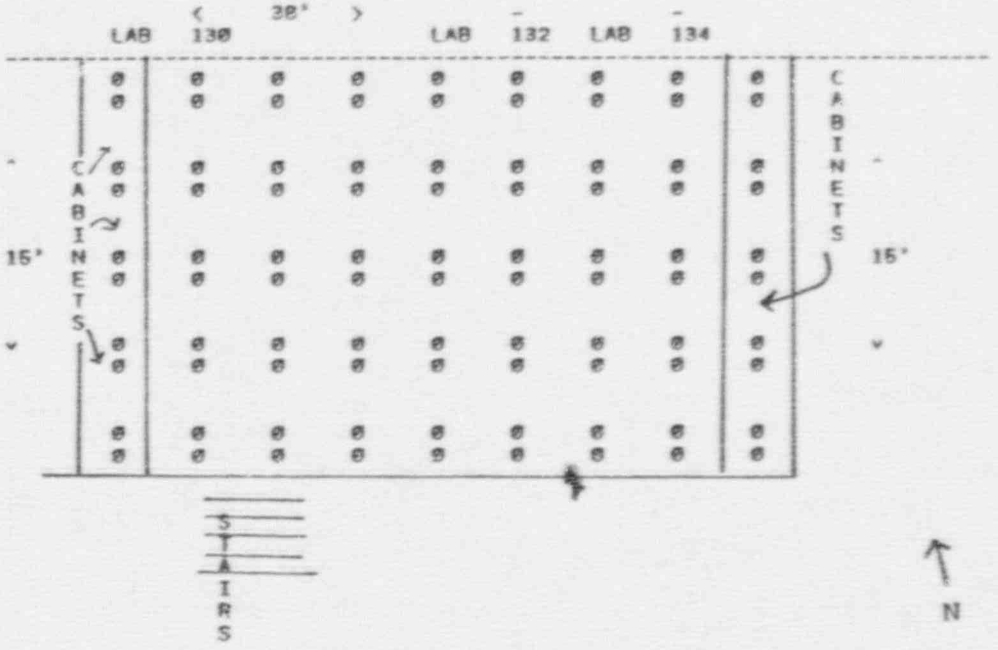


LABS 130, 132 AND 134 COMPLETED DEC. 11, 1987
USING GM COUNTER (TBM-28 #2759 CALIBRATED AUG. 3, 1987)

NOTES:
1. LEVELS WERE MEASURED ON TILE SURFACE AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOD BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. BACKGROUND ON FLOOR TILES WAS 80 PLUS OR MINUS 20 CPM (GM READING).

ATTACHMENT 13 PAGE 2 OF 2

FINAL SURVEY
L-130, 132 AND 134 MEZZANINE



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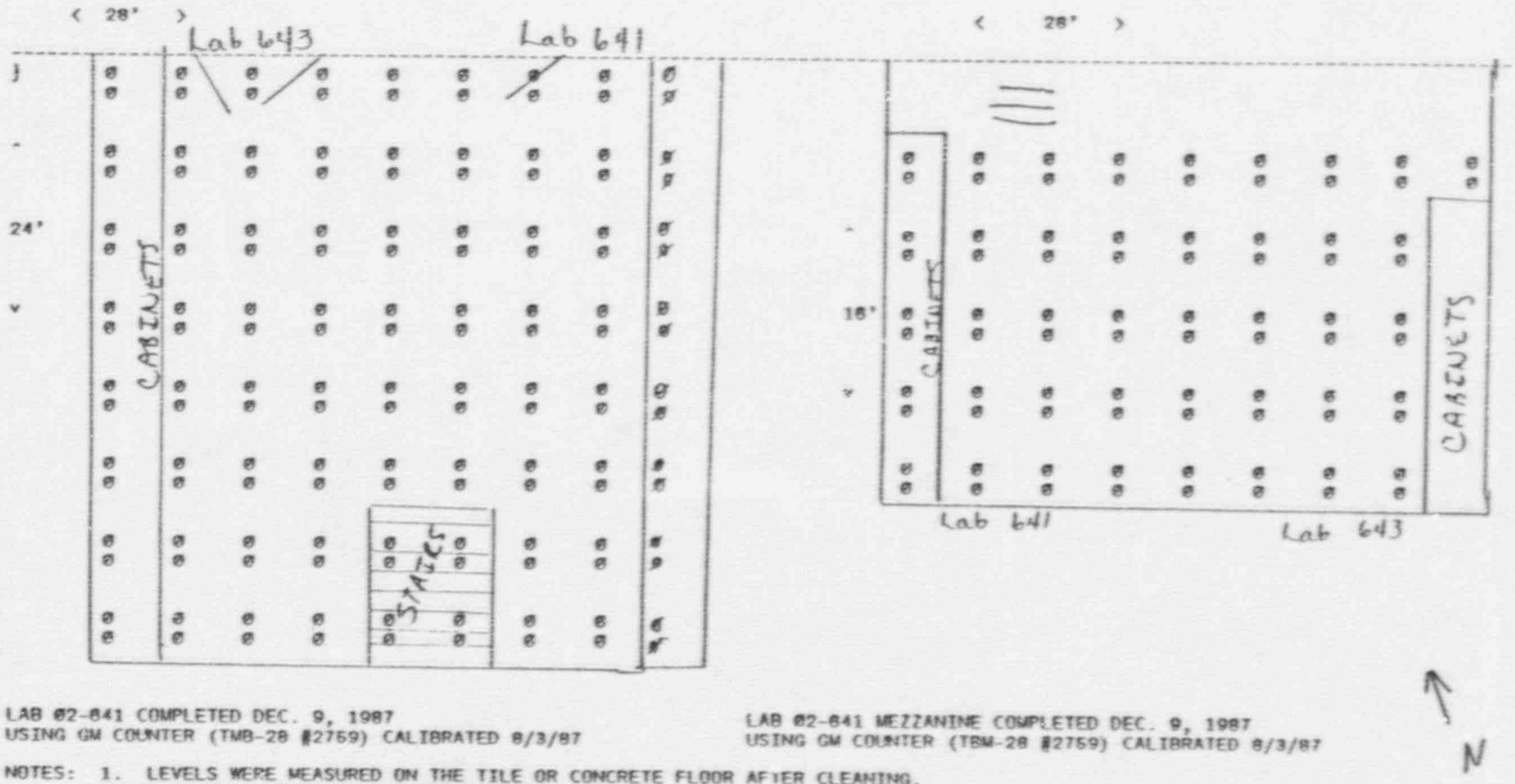
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

MEZZANINE L-130/132/134 COMPLETED DEC. 11, 1987.
USING GM COUNTER (TBM-28 #2759) CALIBRATED AUG. 3, 1987)

NOTES:
1. LEVELS WERE MEASURED ON THE TILE SURFACE AFTER CLEANING
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. BACKGROUND ON FLOOR TILES WAS 60 PLUS OR MINUS 20 CPM.

ATTACHMENT 14
FINAL SURVEY LAB 641/643

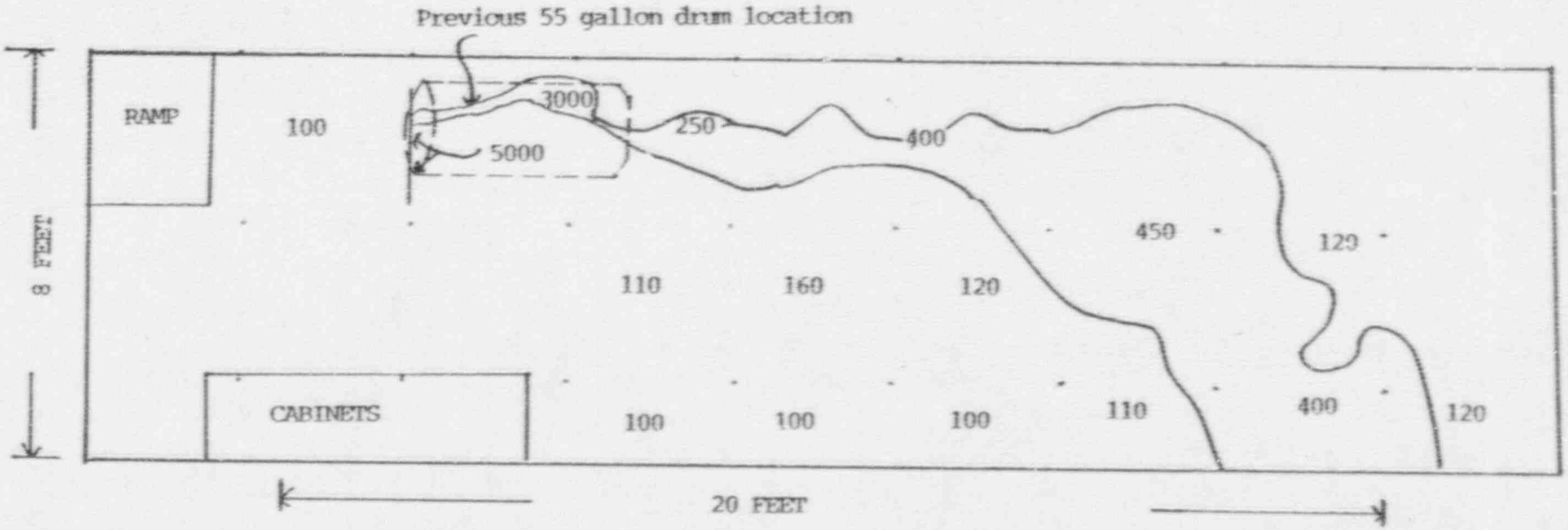


LAB 02-641 COMPLETED DEC. 9, 1987
USING GM COUNTER (TMB-28 #2759) CALIBRATED 8/3/87

LAB 02-641 MEZZANINE COMPLETED DEC. 9, 1987
USING GM COUNTER (TBM-28 #2759) CALIBRATED 8/3/87

NOTES:
1. LEVELS WERE MEASURED ON THE TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. 641 MEZZANINE HAD NO DETECTABLE CONTAMINATION.

ATTACHMENT 15: INITIAL SURVEY OF SERVICE CORE AREA BEHIND LAB 331

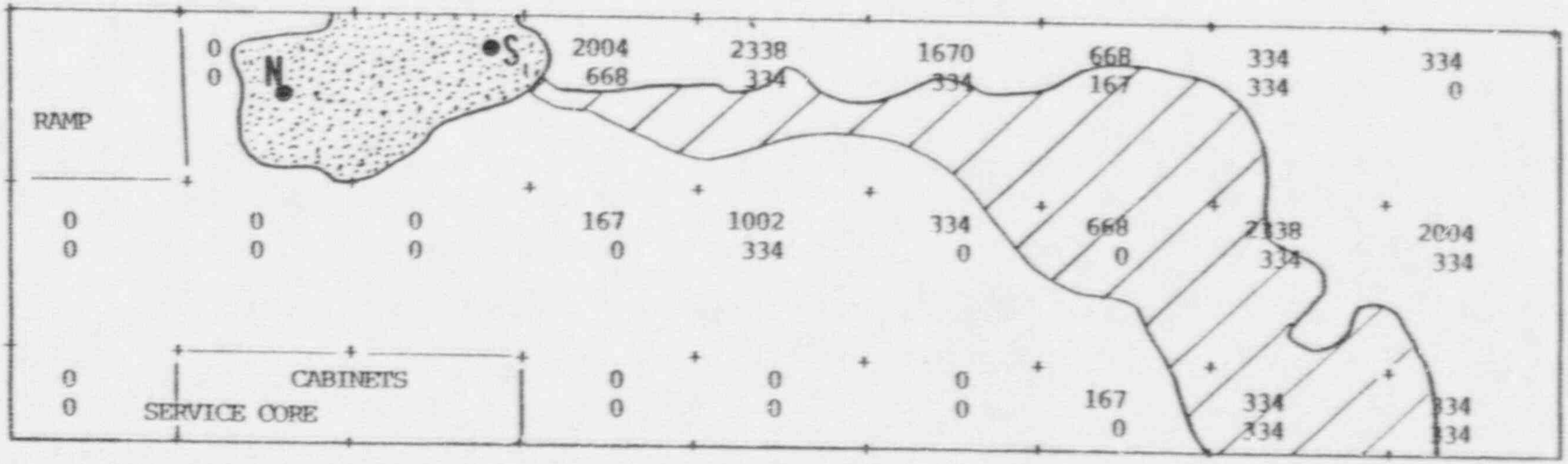


NOTES:

1. Survey completed on 11-9-87 by S. Perelman using TBM-28 #92238 calibrated 11-13-87.
2. Radionuclide contaminant was U-238.
3. All measurements were made on concrete before cleanup.
4. All measurements are in beta/gamma counts per minute.

→ N

ATTACHMENT 15: FINAL SURVEY OF SERVICE CORE AREA BEHIND LAB 331



NOTES:
1. Survey completed on 11-18-87 by S. Perelman using TBM-28 #92238 calibrated 11-13-87.
2. Radionuclide contaminant was U-238.
3. All measurements were made on concrete after cleanup.
4. Each unit represents a three foot by three foot area or less.
5. The top value is the average beta/gamma direct reading in DPM/100cm^2 in a three foot by three foot area or less.
6. The bottom value is the maximum beta/gamma direct reading in DPM for an area less than 100 cm^2.
7. ░ Soil Exposed.
8. ● Soil Sample Locations
9. /// Concrete Scabbled

N →

ATTACHMENT 16
SOIL SAMPLE RESULTS

Sample ID #	Radionuclide Concentration (pCi/g) Co-60	Cs-137	Th-228	Ra-228	Ra-226	U-238	U-235
INITIAL SOIL SAMPLE RESULTS (BEFORE CLEANUP)							
331 Service Core	0.00 ± 0.00	0.00 ± 0.00	0.89 ± 0.07	1.11 ± 0.05	0.56 ± 0.04	457.17± 32.78	5.55 ± 0.26
361 Service Core	0.00 ± 0.00	0.00 ± 0.00	0.60 ± 0.03	0.07 ± 0.05	0.45 ± 0.02	1.01 ± 0.10	< 0.2
FINAL SOIL SAMPLE RESULTS (AFTER CLEANUP)							
331 NORTH END	0.00± 0.00	0.00 ± 0.00	0.96 ± 0.20	1.08± 0.20	0.65± 0.18	4.17± 0.44	0.11 ± 0.05
331 SOUTH END	0.00 + 0.00	0.00 ± 0.00	0.72 ± 0.13	0.75 ± 0.12	0.47 ± 0.15	0.07 ± 0.20	0.06 ± 0.03
361 Service Core	0.00 ± 0.00	0.00 ± 0.00	0.60 ± 0.03	0.07 ± 0.05	0.45 ± 0.02	1.01 ± 0.10	< 0.2

GENERAL ATOMICS

RECEIVED
NRC
REGION V

1988 MAY 13 P 12:33

May 10, 1988
696-1231

Mr. Robert D. Thomas, Chief
Nuclear Materials Safety Section
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Subject: Docket 70-734: SNM-696; Request for Release of Selected Laboratories to Unrestricted Use

Dear Mr. Thomas:

As you are aware, General Atomics (GA) is in the process of decontaminating and obtaining release to unrestricted use of selected laboratories and associated offices in GA's Building 2 (also known as the "L" or Science Laboratory Building). Twenty-five such laboratories were released earlier this year.

GA has recently decontaminated another group of laboratories in Building 2. This group consists of 13 laboratories and associated offices and is designated as "Group 2." GA has no plans for conducting any future activities involving radioactive material in these laboratories and desires to lease them to outside companies. GA also desires to lease the offices across the hall from these laboratories. These offices have never been used for work involving radioactive material. Accordingly, GA hereby requests the requisite independent survey of these laboratories to confirm that they meet the criteria for release to unrestricted use and, based upon such a finding, that these laboratories and associated offices be released to unrestricted use.

To assist you in planning for the confirmatory survey and the subsequent release of the subject facilities to unrestricted use, the results of GA's final radiation and contamination surveys are provided in the enclosed report.

"Group 2" consists of 13 laboratories occupying a total area of 5,652 square feet. A brief history of the use of these laboratories during the past 20 years is provided in the enclosed report. The primary radionuclides previously used in these laboratories were Cs-137, Co-60, U-235, depleted or natural uranium, and thorium. Only three of

10955 JOHN JAY HOPKINS DRIVE, SAN DIEGO, CA 92121-1194 P.O. BOX 85608, SAN DIEGO, CA 92138-5608 (619) 455-3000

the laboratories (i.e., labs 236, 313 and 333) required decontamination beyond the removal/decontamination of sources and contaminated equipment (including hoods and associated ducting and filter plenums). Of these, only a 50 square foot area required cleaning or scabbling. The primary contaminants were identified as Cs-137 and U-238.

GA has decontaminated equipment and facilities consistent with the State of California's and U.S. Nuclear Regulatory Commission's guidelines for release of facilities and equipment to unrestricted use. The results of GA's final surveys (provided in the enclosed report) demonstrate compliance with these guidelines.

GA has tenants who are desirous of occupying the subject laboratories and associated offices as soon as they are released. It is, therefore, important to GA to obtain the requested release as soon as possible. Concurrent with submitting this request to you, we are making a similar request to the State of California Department of Health Services.

If you should have any questions regarding our request or the enclosed report, please contact me at (519) 455-2823.

Very truly yours,

Keith E. Asmussen

Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

KEA/mk
Enclosure

DECONTAMINATION OF SELECTED GENERAL ATOMICS' SCIENCE LABORATORIES FOR RELEASE TO UNRESTRICTED USE

(Group 2)

May 6, 1988

TABLE OF CONTENTS

DECONTAMINATION OF SELECTED GENERAL ATOMICS' SCIENCE LABORATORIES FOR RELEASE TO UNRESTRICTED USE

(Group 2)

May 6, 1988

TABLE OF CONTENTS

DECONTAMINATION OF SELECTED GENERAL ATOMICS' SCIENCE LABORATORIES FOR RELEASE TO UNRESTRICTED USE

(Group 2)

May 6, 1988

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LIST OF ATTACHMENTS

INTRODUCTION

During October, November and December 1987, General Atomics (formerly known as GA Technologies, Inc.) decontaminated a selected group of laboratories in Building 2 (also known as the Science Laboratories Building). A report dated January 17, 1988 documenting these surveys was submitted to the NRC (Reference 1) and to the State of California.

During January, February and March 1988, General Atomics decontaminated another group of laboratories in Building 2; designated as Group 2. GA has no plans for conducting any future activities involving radioactive materials in these laboratories and would like to lease some, or all, of these laboratories to outside companies. The offices across the hall from these laboratories which have never been used for work involving radioactive materials may also be leased to outside companies. Accordingly, GA is requesting the release of these laboratories and their associated offices to unrestricted use.

Group 2 consists of a total of thirteen (13) laboratories having a total area of 5652 ft^2 which will be released to unrestricted use. A brief history of the use of these laboratories in the past twenty (20) years is provided. The primary radionuclides previously used in these laboratories were Cs-137, Co-60, U-235, depleted or natural uranium, and thorium. Only three (3) of the laboratories (236, 313 and 333) required decontamination beyond the removal/decontamination of sources and contaminated equipment (including hoods and associated ducting and filter plenums). Of these, only a 50 ft^2 area required cleaning or scabbling. The primary contaminants were identified as Cs-137 and U-238.

GA has decontaminated equipment and facilities consistent with the State of California's and U. S. Nuclear Regulatory Commission's guidelines for Release of Facilities and Equipment to Unrestricted Use.

The results of the final radiation and contamination surveys are included in this report to demonstrate compliance with the guidelines.

SITE DESCRIPTION

The location of Building 2 with respect to other facilities on the GA Site is shown in Attachment 1. A layout of Building 2 is shown in Attachment 2. The building is divided into three Laboratory sections; Laboratory B, C, and A. Laboratory B includes offices and laboratories from 102 through 243. Laboratory C includes offices and laboratories from 300 through 445 and Laboratory A includes offices and laboratories from 502 through 651. The laboratories to be released to unrestricted use in Group 2 are located in the upper levels of the Laboratory B section and in the upper and lower levels of the Laboratory C section (Attachment 3).

The thirteen (13) laboratories are 228, 230, 232, 236, 311, 313, 319, 331, 333, 419, 421, 435, 437. Laboratories 228/230/232, 331/333, 435/437 and 419/421 are combined labs. Five (5) laboratories have mezzanines. These are 331/333, 419, and 435/437. The mezzanine above lab 419 extends over lab 417. Lab 417 will not be released to unrestricted use at this time. A summary by combined laboratories and mezzanines (where applicable) is provided below:

Laboratory	ft^2
228/230/232	1008
236	336
311	600
313	288
319	288
331/333 and mezzanines	960
419/421	604
417/419 mezzanine	448
435/437 and mezzanine	1120
Total	5652

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Table I (Attachment 4A) is taken from USNRC's criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into our SNM-696 license. The State of California's limits for release of facilities and equipment to unrestricted use are identical to these limits for the radionuclides of concern (predominantly U-238, Cs-137, U-235 and Co-60). These guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," are also known as "DECON-1" are summarized in Table I (Attachment 4B). GA has decontaminated the laboratories to levels below these guidelines.

INSTRUMENTATION AND MEASUREMENT LIMITS FOR RELEASE

Instrumentation

1. Beta/gamma counters - Model TBM 28 geiger counters manufactured by Technical Associates were used to survey surfaces for beta/gamma contamination. The instruments contain a pancake Geiger-Mueller (GM) detector which has a window thickness of less than 7 mg/cm^2. The instrument has three ranges covering from 0-50,000 counts per minute (cpm). The instruments are calibrated semiannually using a Cs-137 standard or a pulser.

2. Alpha counters - Model 12 rate meters with Model 43-44 air proportional alpha probes manufactured by Ludlum Measurements Inc. were used to survey for alpha contamination. The instrument has four ranges covering from 0-500,000 counts per minute. Alpha counters are calibrated using an alpha source traceable to NBS.

3. Gamma Detectors - Model 19 microR meters with NaI scintillation detectors manufactured by Ludlum Measurements Inc. were used in all locations. The instrument has three ranges from 0 - 5 mR/hr. The microR meters are normally returned to the manufacturer for calibration annually.

Gamma spectral analysis on selected samples were performed using a high purity germanium detector manufactured by Canberra Industries, Inc.

4. Alpha/Beta counting systems are used to analyze wipe samples .

The alpha/beta systems and the germanium detector system has been calibrated for various type of samples. This calibration is checked on a daily or weekly basis depending on usage.

Measurement Limits for Release

The final survey results have been converted from cpm (counts per minute) for a particular detector to dpm/100 cm^2 by correcting the counts per minute observed by an appropriate detector for background, detector efficiency and geometric factors associated with the instrumentation.

1. Background

   A "standard" natural background was determined for each instrument and subtracted from the survey readings. The surface beta/gamma readings were completed using the TBM Model 28 GM counters which have a background concrete reading of 80 plus or minus 20 counts per minute.

2. Efficiency

   Ten (10) of the laboratories did not require decontamination after the sources and equipment were removed. A total of 50 ft^2 in three (3) of the laboratories (236, 313 and 331/333) required cleaning of surfaces or scabbling of the concrete in order to meet the guidelines in Table 1 (Attachments 4A and 4B). The contaminants were identified as Cs-137 in labs 236 and 313 and U-238 in lab 333.

   NBS traceable standards were used to calibrate instruments for Cs-137 and U-238 efficiencies. The standards consisted of concrete blocks having an area of approximately 25 cm x 25 cm each spiked with an NBS traceable standard liquid solutions of Cs-137 or U-238.

(Attachment 4A and 4B). The maximum allowable level is 15,000 dpm for an area less than 100 cm^2. Surface measurements of the blocks were obtained with the instruments and percent efficiencies were obtained. The readings were corrected for efficiency by multiplying by a correction factor.

3. Geometry Correction

The values listed in Table 1 are in dpm/100 cm^2, therefore, a correction factor was applied to the values to correct for the smaller area of the detector. The TBM-28 has a 5 cm diameter detector which measures a 19.6 cm^2 area. The reading is corrected by multiplying by 5.1. The alpha detectors used for the surveys "see", at any given time, an area of about 78.7 cm^2, which then requires a correction factor of 1.27.

PREVIOUS LABORATORY ACTIVITIES AND EFFORT OF DECONTAMINATION REQUIRED

INITIAL SURVEY

An initial beta/gamma survey was conducted during and after the removal of all equipment (including the hood, filters, plenums and associated ducting) to determine the extent of the remaining contamination and the radionuclides present. There initial surveys are shown in Attachments 8-11. All values are provided in cpm (beta/gamma contamination) using a Technical Associates Model TBM-28 GM counter. Three laboratories had some contamination present either on the floor (labs 313 and 333) or on the floor and wall (lab 236). Samples collected and gamma scanned showed the contaminants were Cs-137 in labs 236 and 313, and U-238 in lab 333. All areas requiring decontamination were then cleaned until they were below the release criteria. Every reasonable effort was made to eliminate residual contamination. No covering was applied to the contaminated surfaces of equipment or structures such as paint, plating etc.

The total area of these laboratories is 912 ft^2 (excluding the mezzanines) but only about 50 ft^2 required decontamination. The cleanup effort involved washing of floors, removal of floor tiles, removal or cleanup of hoods, associated plenums and ducting and the scabbling of about 12 ft^2 of concrete on the floor and about 9 ft^2 of concrete brick from the northeast wall of lab 236.

A brief description of the previous use of the 13 laboratories is provided below as well as the total area of each.

Labs 228/230/232

Lab 230 was the nuclear calibration laboratory at GA for many years. Primarily only sealed calibration sources were used in this laboratory. In addition, small quantities of U-235 (<15 grams) were authorized to be used in the lab as well as small quantities of tritium and krypton gas. The sources were used to calibrate radiation detection instrumentation. Surveys using NaI detectors as well as geiger counters were conducted in this laboratory. No contamination was detected on the floors, walls or cabinets. Radioactive material were not used in labs 228 or 232.

Lab 236

This laboratory was previously an analytical chemistry laboratory. Small quantities of various radionuclides with atomic numbers 1-105 were used in this lab. The contaminated concrete removed from the laboratory was gamma scanned to determine the contaminant. Cs-137 was the predominant radionuclide detected.

Laboratory 236 was decontaminated to meet the Cs-137 levels in Table 1 (Attachments 4A and 4B).

Lab 311

This laboratory was used to analyze reactor material using radioactive tracers and for analysis of samples containing mixed fission products, thorium, uranium, Cs-137, and Sr-89. The hood required decontamination and some contaminated equipment was disposed of radioactive waste. The floor tiles were not contaminated but were removed to facilitate a meter survey of the concrete below. The hood was decontaminated to meet the levels for release to unrestricted use. The rest of the lab was not contaminated. No contamination was detected on the concrete surface.

Lab 313

This laboratory was used by the fuel chemistry department for various research and development projects. The primary radionuclides used were U-235, U-238 and thorium. Some portions of the laboratory required decontamination. Contamination was found on a small portion of the exterior of a pipe. The pipe was removed. The floor drain had some minor contamination (about 300 cpm) which was removed with commercial cleaners. Some loose contamination found under a laboratory counter was cleaned up and the local floor tiles were removed to verify that no contamination had "slipped through the cracks". No contamination was detected on the concrete below.

Lab 319

The only recorded use of this laboratory was for a vapor plateout experiment using 5 millicuries of Cs-137. The cesium vapor was contained in pressurized flow lines within a hood which was evidently disposed of in 1976. No contamination was found in the lab.

Lab 331/333 and mezzanine

This laboratory was used primarily for work involving the production of fuel pellets and for gas diffusion experiments on fuel materials. The primary radionuclides used were uranium and thorium. Sintering furnaces and fuel production equipment were disposed of as radioactive waste. Contaminated floor tiles were removed as well as portions of the mezzanine column base in lab 333. Two sinks previously used to dispose of radioactive liquids were removed from the laboratory. The liquid waste had been collected in 55 gallon drums previously located in the service core area.

Lab 419/421 and mezzanine

Laboratory 419/421 had been used recently for Cs-134 diffusion tests on graphite samples. Some loose contamination from the oven disassembly process was cleaned up during the cleanup when the project was moved to another lab several months ago. No contamination was detected in during a re-survey conducted recently. The mezzanine has no recorded use of radioactive material and no contamination was detected.

Lab 435/437 and mezzanine

Thermal tests and X-ray radiography of fuel particles and fuel rods were conducted in the laboratory. Th-232, U-235 and U-238 were used. The hood and ducting were clean and were removed from the lab but the filter box for the hood had interior contamination and was disposed of as radioactive waste. No contamination was found on the floors or walls.

FINAL CONTAMINATION SURVEYS

Table 1 (Attachments 4A and 4B) provides limits for acceptable removable surface contamination levels. Although the type of decontamination efforts (i.e. washing, scabbling and vacuuming) conducted in these laboratories eliminates the probability of removable contamination, a detailed large area wipe survey was conducted. These large area wipes were collected primarily on the floors of the laboratories. The wipe sample locations are shown in Attachment 5 and the results are shown in Attachment 6. The contamination levels in every location were < 20 dpm/100 cm^2 area, and well below the Table 1 limits (Attachment 4) for removable contamination.

FINAL RADIATION SURVEYS

Final surveys of all laboratories were conducted using the TBM-28 GM counters. The measurements of average contamination were averaged over 1 M^2 and are given in dpm/100 cm^2. The maximum contamination level applies to an area of not more than 100 cm². The results of these surveys are shown in Attachments 7 through 14 as described below.

Attachment 7: Final Radiation Surveys of Labs 228/230/232
Attachment 8: Initial and Final Radiation Survey of Lab 236
Attachment 9: Initial and Final Surveys of Lab 311
Attachment 10: Initial and Final Surveys of Lab 313
Attachment 11: Initial and Final Surveys of Lab 319
Attachment 12: Final Surveys of Labs 331/333 and mezzanines
Attachment 13: Final Surveys of Labs 419/421 and 417/419 mezzanine
Attachment 14: Final Surveys of Labs 435/437 and mezzanine

A microR meter was also used to survey the laboratories and determine if there was any residual contamination remaining. The final surveys showed the measurements were all within normal background concrete levels.

Alpha counters were also used to survey the laboratories. However, since the contaminants were Cs-137 and U-238, the beta/gamma levels were used to determine allowable release levels.

COMPLIANCE WITH THE TARGET CRITERIA

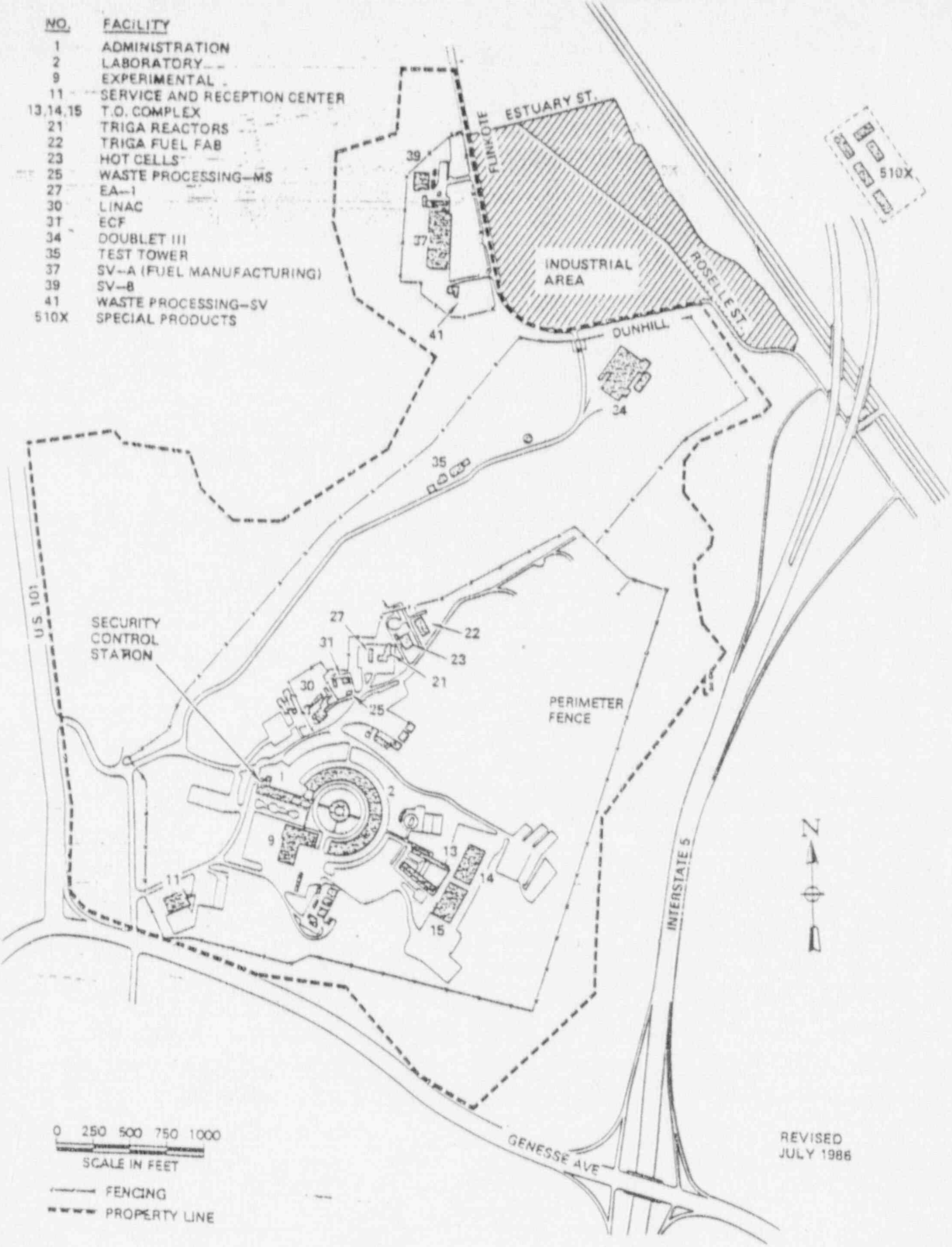
The laboratories were cleared of all radioactive material. Contaminated equipment including hoods, filter plenums and associated ducting was either decontaminated to natural background levels or disposed of as radioactive waste. All floors, walls and concrete surfaces were also decontaminated below the release levels specified in Table 1 (Attachment 4A and 4B). The final surveys provided in this report demonstrate compliance with the criteria for release to unrestricted use.

CONCLUSION

The above described thirteen (13) laboratories have been cleared for release to unrestricted use. Final surveys show the levels meet the guidelines for release to unrestricted use.

REFERENCES

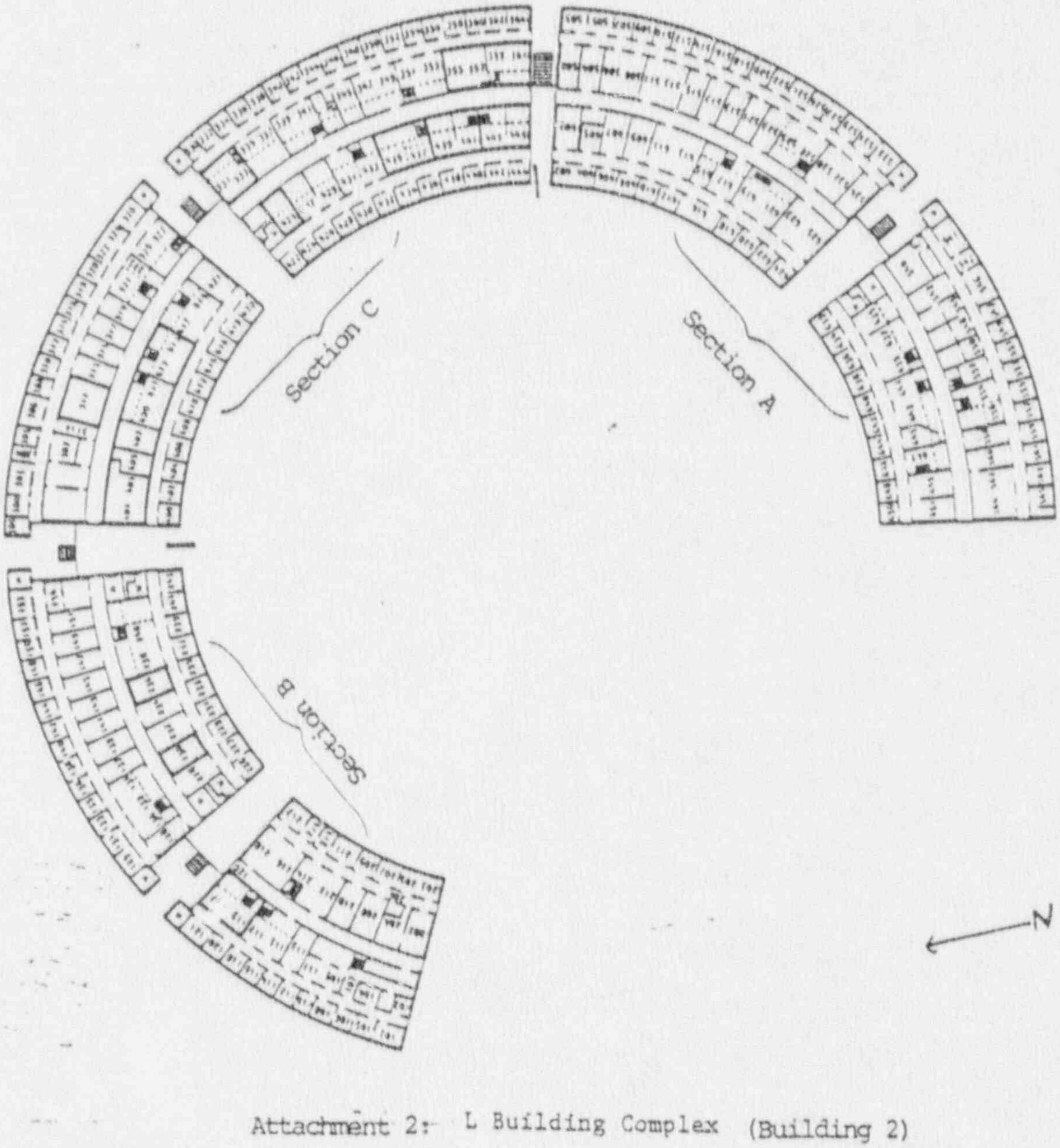
1. Asmussen, Keith A., "Docket 70-734: SNM-696; Request for Release to Unrestricted Use- Revised Final Report" letter 696-1163 to R. D. Thomas, dated January 19, 1988.



NO.	FACILITY
1	ADMINISTRATION
2	LABORATORY
9	EXPERIMENTAL
11	SERVICE AND RECEPTION CENTER
13,14,15	T.O. COMPLEX
21	TRIGA REACTORS
22	TRIGA FUEL FAB
23	HOT CELLS
25	WASTE PROCESSING—MS
27	EA—1
30	LINAC
31	ECF
34	DOUBLET III
35	TEST TOWER
37	SV—A (FUEL MANUFACTURING)
39	SV—B
41	WASTE PROCESSING—SV
510X	SPECIAL PRODUCTS

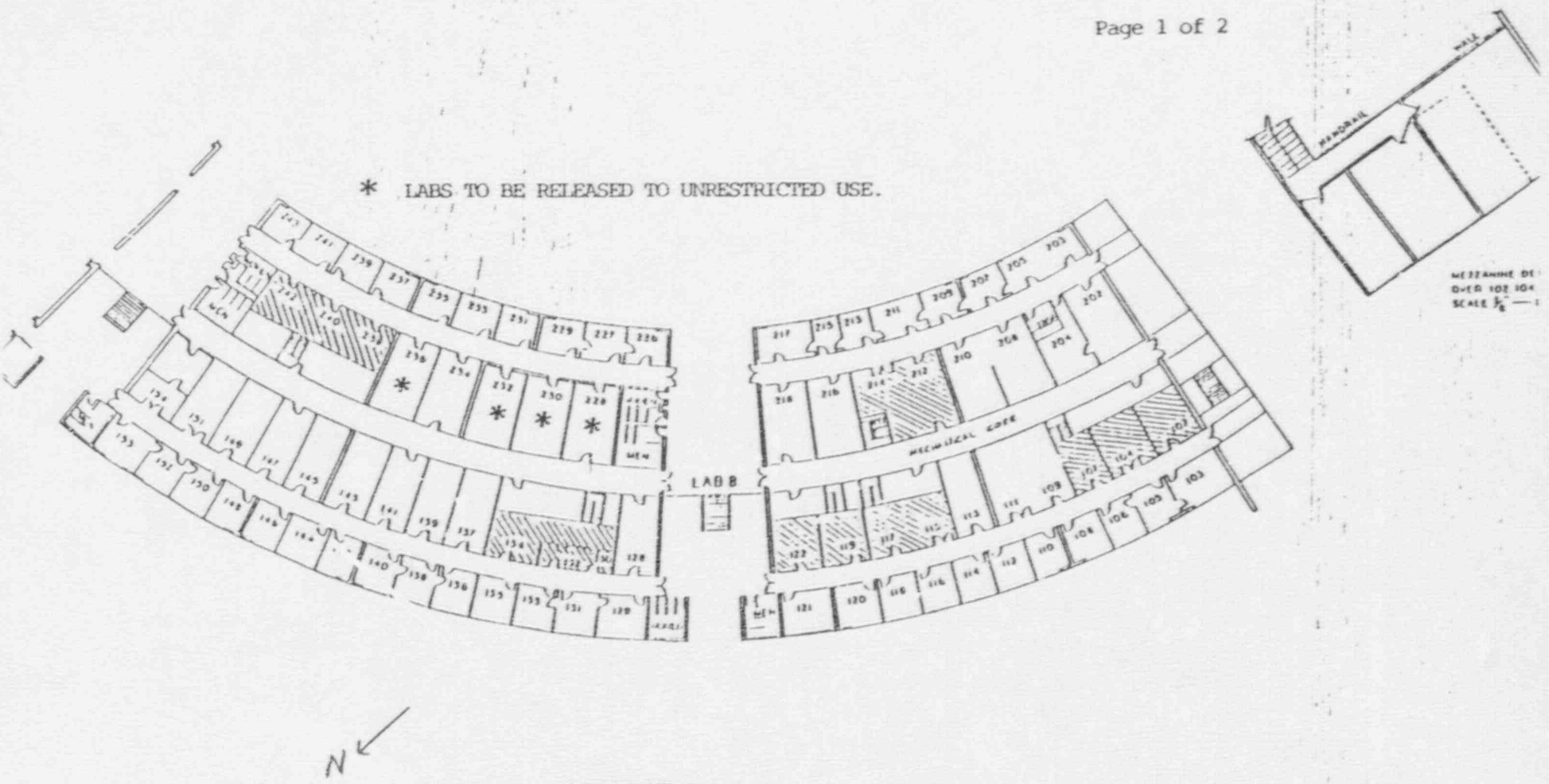
REVISED
JULY 1986

Attachment 1: PLAN VIEW OF SITE



Attachment 2: L Building Complex (Building 2)

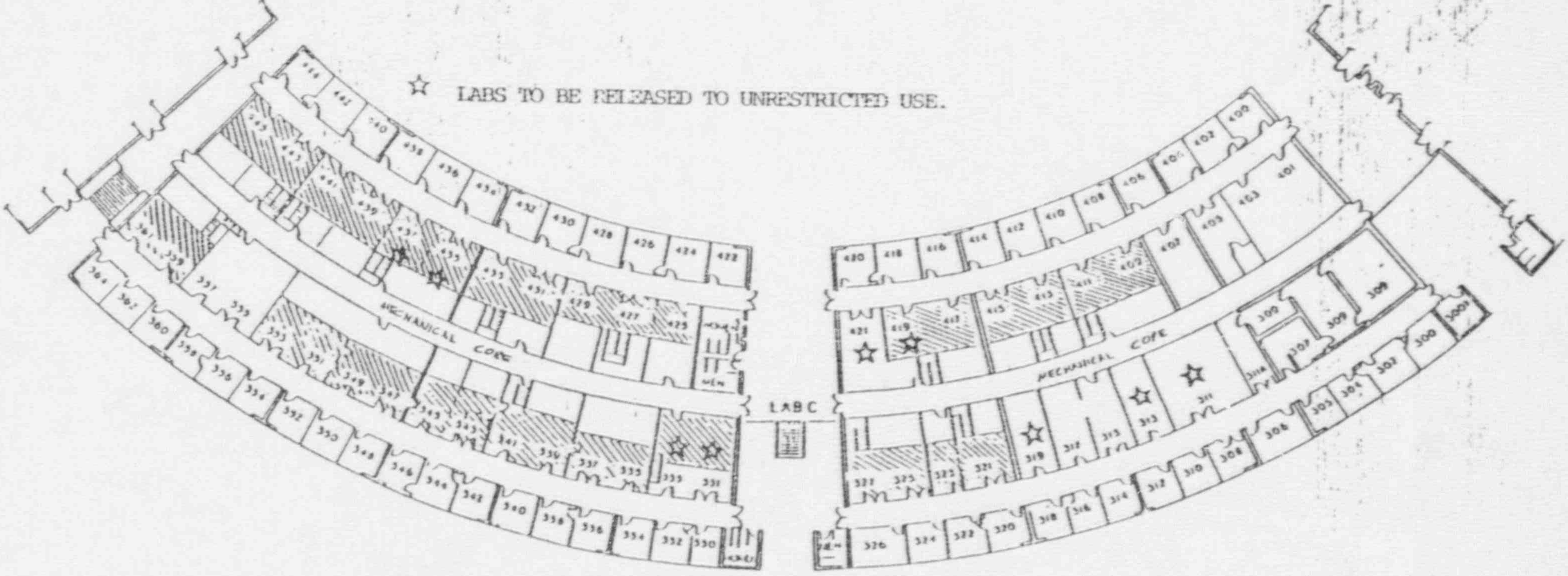
* LABS TO BE RELEASED TO UNRESTRICTED USE.



▨ MEZZANINE

LABORATORY B
BUILDING 2

ATTACHMENT 3


☆ LABS TO BE RELEASED TO UNRESTRICTED USE.

LABORATORY C BUILDING 2

ATTACHMENT 2

ATTACHMENT 4A

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES^{a}	AVERAGE$^{b\ c\ f}$	MAXIMUM$^{b\ d\ f}$	REMOVABLE$^{b\ e\ f}$
nat, U-235, U-238, and sociated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
ansuranics, Ra-226, Ra-228, 230, Th-228, Pa-231, -227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
-nat, Th-232, Sr-90, -223, Ra-224, U-232, I-126, 131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
ta-gamma emitters (nuclides th decay modes other than lpha emission or spontaneous ssion) except Sr-90 and thers noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm^2.

The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

ATTACHMENT 4B

TABLE I

ACCEPTABLE SURFACE CONTAMINATION LEVELS 1/ 2/

NUCLIDE[a]	AVERAGE[b] [c] (dpm/100 cm^2)	MAXIMUM[b] [d] (dpm/100 cm^2)	REMOVABLE[b] [e] (dpm/100 cm^2)
a) U-nat, U-235, U-238, and associated decay products	5,000	15,000	1,000
b) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231 Ac-227, I-125, I-129	100	300	20
c) Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
d) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
e) H-3, C-14 except as DNA precursors f/	20,000	60,000	4,000

[illegible]re surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits [illegible]ablished for alpha- and beta-gamma-emitting nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm^2.

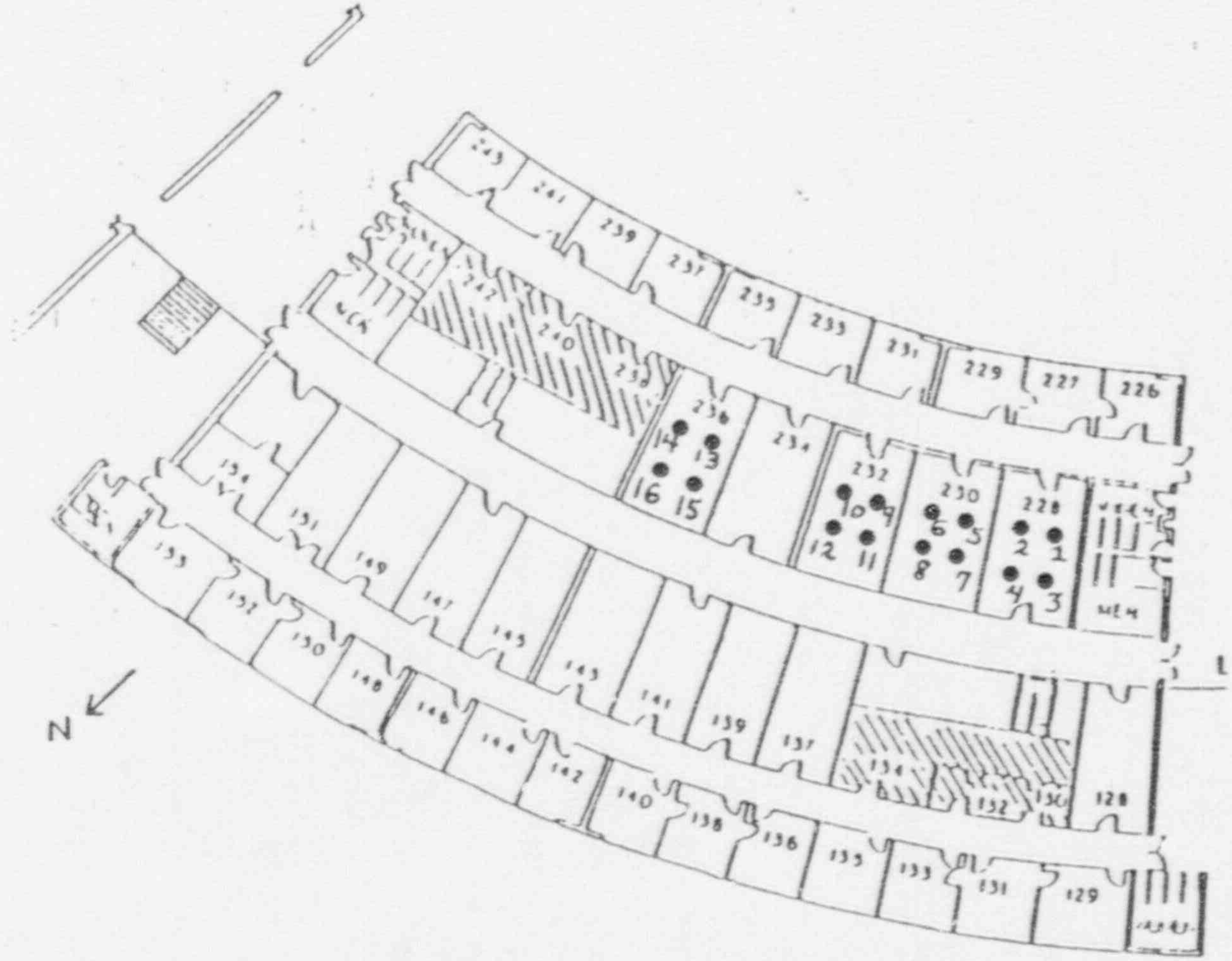
The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

DNA precursors mean molecules or compounds that are directly incorporated into the DNA molecule during DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and nucleosides. The acceptable surface contamination levels for H-3 and C-14 in DNA precursors are as tabulated in paragraph (d) for beta-gamma-emitters.

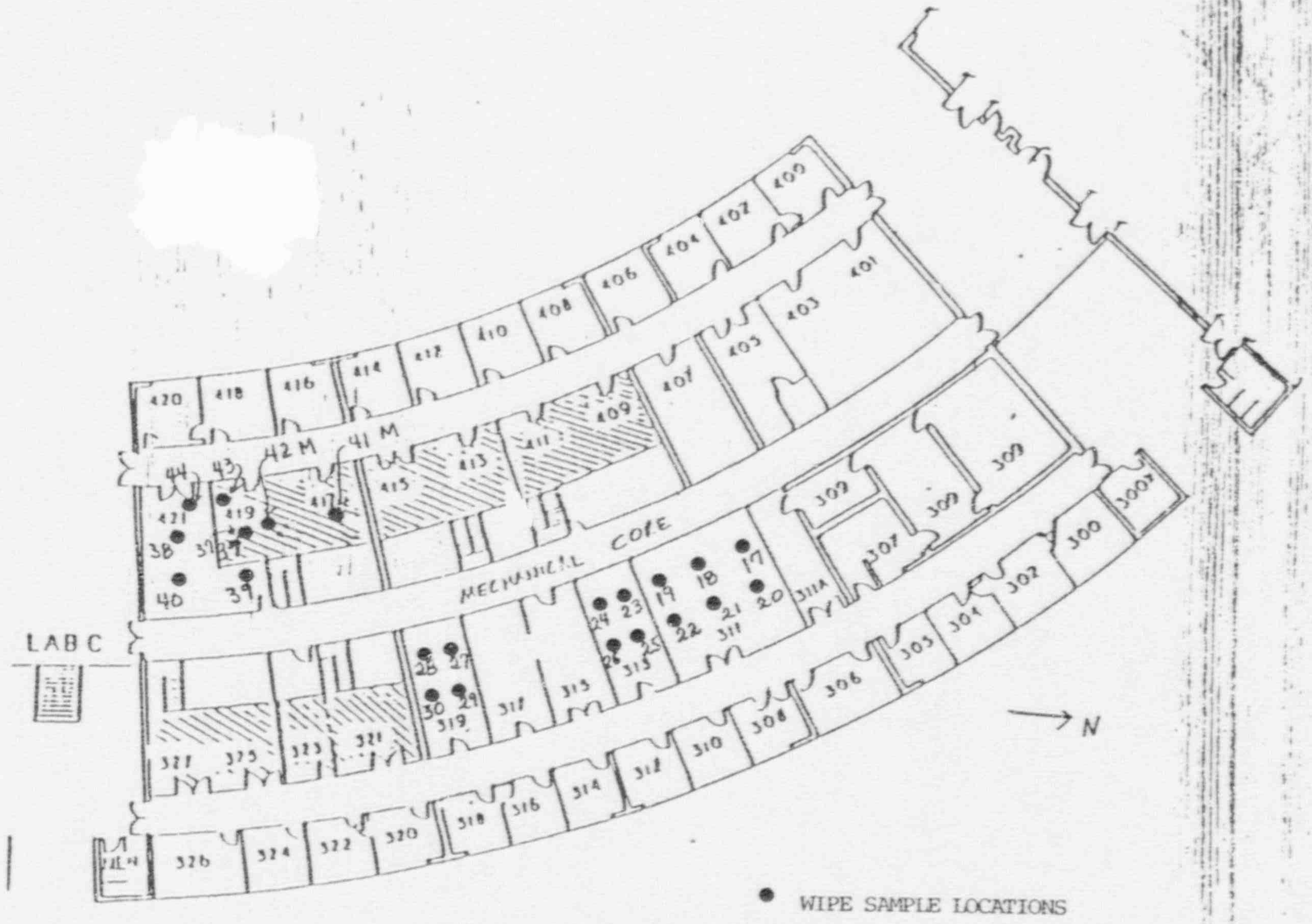
[illegible]SNRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, Washington .C. (June 1974)

/ ANSI, Control of Radioactive Surface Contamination on Materials, Equipment and Facilities To Be Released for Uncontrolled Use, final draft, proposed American National Standard N-328, Atomic Industrial Forum, Inc., N.Y. (June 1974)

ATTACHMENT 5: Page 1 of 3



● WIPE SAMPLE LOCATIONS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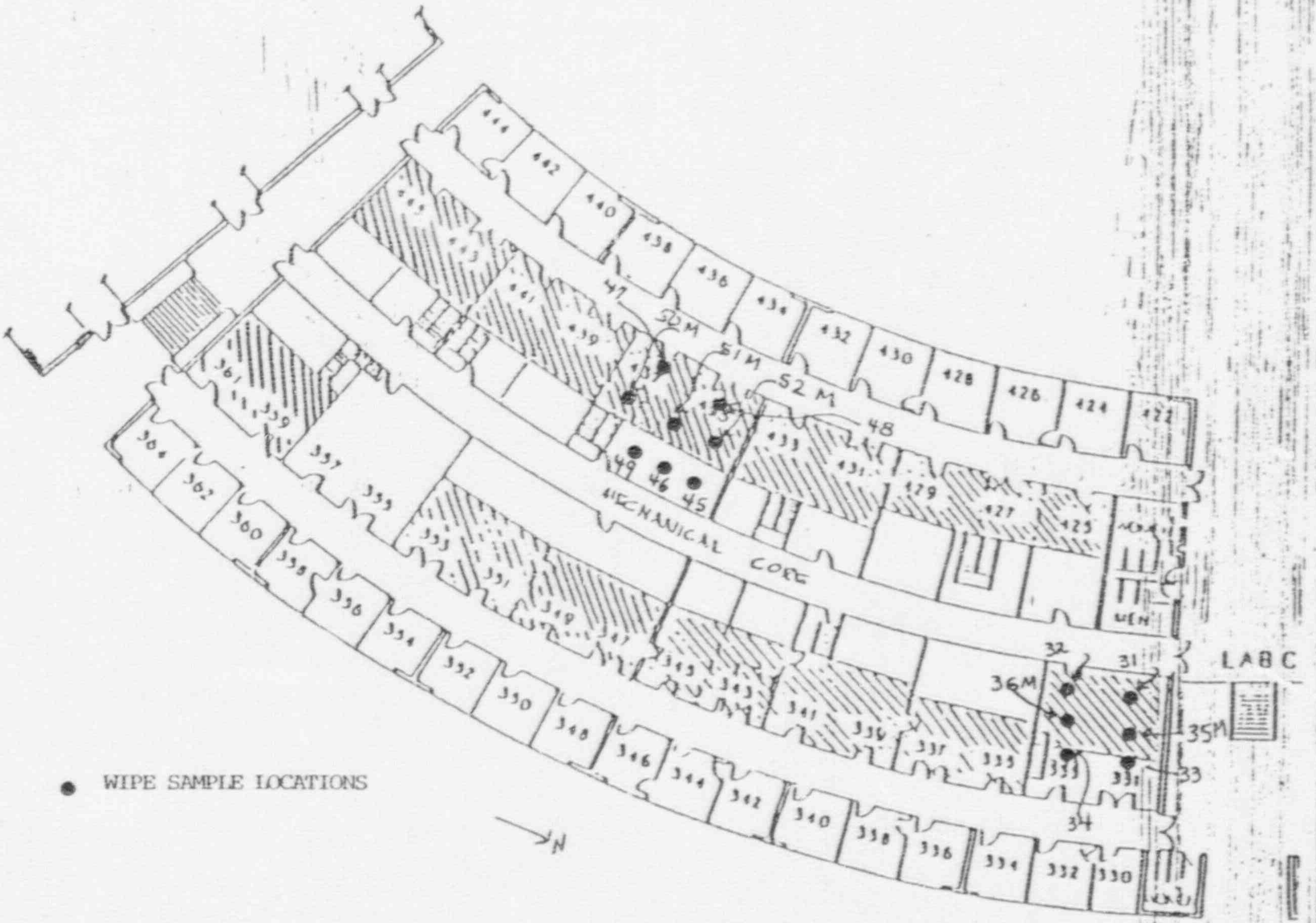
● WIPE SAMPLE LOCATIONS

ATTACHMENT 5: Page 3 of 3



● WIPE SAMPLE LOCATIONS

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

APR 28 1988

			ALPHA		BETA	
SAMPLE ID		COUNT LENGTH MIN	DPM/100 SQ.CM	% ERROR 95% CL	DPM/100 SQ.CM	% ERROR 95% CL
1 LAPS W-1	L-228	1.	<1.212E-02	95.00	<3.785E-02	95.00
2 4/28/88	L-228	1.	<1.212E-02	95.00	<2.105E-01	95.00
3	228	1.	<1.212E-02	95.00	<2.105E-01	95.00
4	228	1.	<1.212E-02	95.00	9.756E-01	146.13
5	230	1.	2.633E-01	245.03	<1.721E 00	95.00
6	230	1.	<1.212E-02	95.00	<2.105E-01	95.00
7	230	1.	<1.212E-02	95.00	<3.785E-02	95.00
8	230	1.	2.633E-01	245.03	<7.571E-01	95.00
9	232	1.	<1.212E-02	95.00	<2.105E-01	95.00
10	232	1.	<1.212E-02	95.00	<3.785E-02	95.00
11	232	1.	2.633E-01	245.03	<3.785E-02	95.00
12	232	1.	<1.212E-02	95.00	<2.105E-01	95.00
13	236	1.	2.633E-01	245.03	<2.105E-01	95.00
14	236	1.	<1.212E-02	95.00	<2.105E-01	95.00
15	236	1.	<1.212E-02	95.00	<2.105E-01	95.00
16	236	1.	<1.212E-02	95.00	<2.105E-01	95.00
17	311	1.	<1.212E-02	95.00	<2.105E-01	95.00
18	311	1.	<1.212E-02	95.00	<2.105E-01	95.00
19	311	1.	<1.212E-02	95.00	<1.252E 00	95.00
20	311	1.	<1.212E-02	95.00	<1.252E 00	95.00
21	311	1.	2.633E-01	245.03	<7.571E-01	95.00
22	311	1.	<1.212E-02	95.00	<1.252E 00	95.00
23	313	1.	<1.212E-02	95.00	9.756E-01	146.13
24	313	1.	<1.212E-02	95.00	<7.571E-01	95.00

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

Attachment 6: Page 2 of 3

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

			ALPHA		BETA	
	SAMPLE ID	COUNT LENGTH MIN	DPM/100 SQ.CM	% ERROR 95% CL	DPM/100 SQ.CM	% ERR 95%
25	313	1.	2.633E-01	245.03	<7.571E-01	95.00
26	313	1.	<1.212E-02	95.00	<1.252E 00	95.00
27	319	1.	<1.212E-02	95.00	<1.721E 00	95.00
28	319	1.	<1.212E-02	95.00	<1.252E 00	95.00
29	319	1.	<1.212E-02	95.00	1.626E 00	103.73
30	329	1.	2.633E-01	245.03	<7.571E-01	95.00
31	331	1.	<1.212E-02	95.00	<7.571E-01	95.00
32	333	1.	5.925E-01	154.00	<7.571E-01	95.00
33	331	1.	5.925E-01	154.00	<1.721E 00	95.00
34	333	1.	<1.212E-02	95.00	<1.252E 00	95.00
35	331 Mezz.	1.	<1.212E-02	95.00	<2.105E-01	95.00
36	333 Mezz.	1.	<1.212E-02	95.00	<3.785E-02	95[illegible]
37	419	1.	2.633E-01	245.03	<1.252E 00	95.00
38	421	1.	1.251E 00	103.16	<1.252E 00	95.00
39	419	1.	<1.212E-02	95.00	<2.105E-01	95.00
40	421	1.	<1.212E-02	95.00	<3.785E-02	95.00
41	412 Mezz.	1.	<1.212E-02	95.00	<2.105E-01	95.00
42	419 Mezz.	1.	<1.212E-02	95.00	<3.785E-02	95.00
43	419	1.	2.633E-01	245.03	<1.252E 00	95.00
44	421	1.	<1.212E-02	95.00	<7.571E-01	95.00
45	435	1.	<1.212E-02	95.00	<1.252E 00	95.00
46	435	1.	5.925E-01	154.00	<7.571E-01	95.00
47	437	1.	2.633E-01	245.03	<7.571E-01	95.00
48	435	1.	2.633E-01	245.03	1.596E 00	105.77

NOTE! THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES

ATTACHMENT 6: Page 3 of 3

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
49 437	1.	<1.212E-02	95.00	<3.785E-02	95.00
50 437 Mezz.	1.	<1.212E-02	95.00	<3.785E-02	95.00
51 435 Mezz.	1.	<1.212E-02	95.00	<7.571E-01	95.00
52 435 Mezz.	1.	2.633E-01	245.03	<1.252E 00	95.00
AVERAGE		1.274E-01		6.870E-01	

NOTE! THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

ATTACHMENT 7: FINAL SURVEYS OF LABS 228,230/232

LAB 228	14	X	24		LAB 230	14	X	24		LAB 232	14	X	24	
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

FINAL SURVEYS OF LABS 228/230/232   COMPLETED APRIL 18, 1988.
USING GM COUNTER (TBM-28 #9860) CALIBRATED MARCH 9, 1988.

N

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. RADIOACTIVE MATERIAL WAS USED ONLY IN LAB 230. NO CONTAMINTATION DETECTED.

ATTACHMENT 8 PAGE 1 OF 2: INITIAL SURVEY OF LAB 238

< 24 FT > WALL
FLOOR

^	100 400	100 100	100 100	100 100	100 220
24	100 100	100 100	100 100	100 100	10000 50000
FT	100 100	100 100	100 100	100 100	200 280
v	100 100	100 100	100 100	100 100	100 100
F L O O R	100 100	100 100	100 100	100 100	100 100
	100 100	100 100	100 100	100 100	100 150
	100 100	100 100	100 100	100 100	100 100
	100 100	100 100	100 100	100 100	100 100

Northeast

100 160	3000 20000
100 160	300 1000
100 100	
100 100	

↑
N

INITIAL SURVEY OF LAB 238 COMPLETED DURING JANUARY AND FEBRUARY 1988 USING GM COUNTER (TBM-28 #92239) CALIBRATED NOV. 13, 1987.

NOTES:
1. INITIAL SURVEYS SHOWED CONTAMINATION ON SOME FLOOR TILES AND THE NORTHEAST WALL OF LAB.
2. GAMMA SCANS SHOWED CONTAMINANT WAS CS-137.
3. VALUES PROVIDED ABOVE ARE THE AVERAGE (TOP) AND MAXIMUM (BOTTOM) READING IN COUNTS PER MINUTE (CPM).

ATTACH_8 8R x 14C

ATTACHMENT 8 PAGE 2 OF 2: FINAL SURVEY OF LAB 238

< 14 FT >
FLOOR

^	0 3568	0 1784	0 1784	0 1784	0 1784	1784 *2141
24	0 5352	0 1784	0 1784	0 1784	0 1784	1784 *2854
FT	0 8920	0 1784	0 1784	0 1784	0 1784	1784 *2141
v	1784 *2141	1784 *2498	0 1784	0 1784	0 1784	0 1784
	0 1784	0 1784	0 1784	0 1784	0 1784	0 1784
	0 1784	0 1784	0 1784	0 1784	0 1784	0 7136
	0 1784	0 1784	0 1784	0 1784	0 1784	0 1784
	0 1784	0 1784	0 1784	0 1784	0 1784	0 3568

NORTH WALL
EAST

0 2676	
0 8920	
0 1784	
892 8920	892 4460
892 3568	0 1784
0 0	
0 0	

N

FINAL SURVEY OF LAB 238 COMPLETED APRIL 4, 1988.
USING GM COUNTER (TBM-28 #92238) CALIBRATED NOVEMBER 13, 1987.

NOTES:
1. ALL FLOOR TILES WERE REMOVED.
2. CONTAMINATION FOUND ON 12 FT2 OF CONCRETE ON FLOOR AND 9 FT2 OF THE NORTHEAST WALL. BOTH WERE SCABBLED TO MEET RELEASE CRITERIA.
3. LEVELS WERE MEASURED ON CONCRETE FLOOR AFTER SCABBLING.
4. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
5. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
6. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
7. REST OF WALL AREA HAD NO DETECTABLE CONTAMINATION.

ATTACHMENT 9: INITIAL AND FINAL SURVEY OF LAB 311

24 X 25

80 80	80 80	80 80	80 80	80 80	80 80	80 80	80 100
80 80 HOOD	80 80	80 80	80 80	80 80	80 80	80 80	80 120
300 1600	80 80	80 80	80 80	80 80	80 80	80 80	80 120
100 400	80 80	80 80	80 80	80 80	80 80	80 80	80 100
80 100 COUNTER	80 80	80 80	80 80	80 80	80 80	80 80	80 100
80 100	80 80	80 80	80 80	80 80	80 80	80 80	80 100
80 100	80 80	80 80	80 80	80 80	80 80	80 80	80 110
80 80	80 80	80 80	80 80	80 80	80 80	80 80	80 80

INITIAL SURVEY COMPLETED FEB. 9 & 16, 1988
USING GM COUNTER (TBM-28 #92238) CALIBRATED NOV. 13, 1987
ALL VALUES ARE IN COUNTS PER MINUTE
BACKGROUND READING IS 80 PLUS OR MINUS 20 CPM

24 X 25

0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0 HOOD	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0 COUNTER	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

FINAL SURVEY COMPLETED MARCH 17, 1988
USING GM COUNTER (TBM-28 #92238) CALIBRATED 11/13/87

INITIAL SURVEY NOTES:
HOOD WAS CONTAMINATED IN ~4 FT SQUARE AREA TO 1600 CPM AND WAS DECONTAMINATED TO BACKGROUND LEVELS.

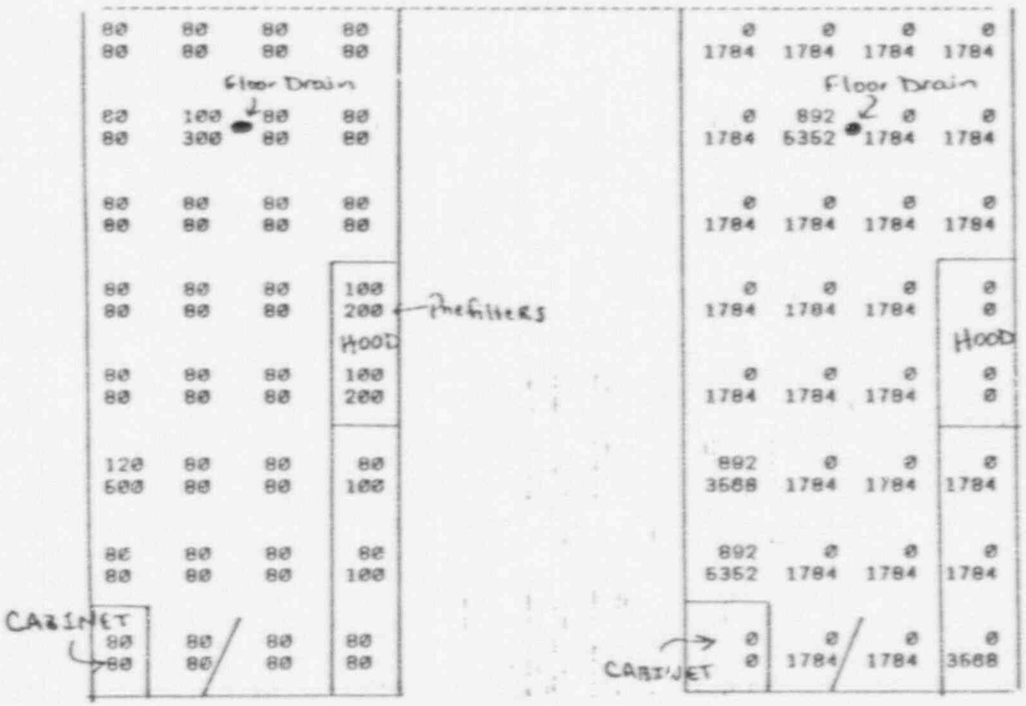
N

FINAL SURVEY NOTES:

1. LEVELS WERE MEASURED ON CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

ATTACHMENT 10: INITIAL AND FINAL SURVEY OF LAB 313

12 X 24 FT - 12 X 24



80 80	80 80	80 80	80 80
80 80	100 300	80 80	80 80
80 80	80 80	80 80	80 80
80 80	80 80	80 80	100 200
80 80	80 80	80 80	100 200
120 600	80 80	80 80	80 100
80 80	80 80	80 80	80 100
80 80	80 80	80 80	80 80

0 1784	0 1784	0 1784	0 1784
0 1784	892 6352	0 1784	0 1784
0 1784	0 1784	0 1784	0 1784
0 1784	0 1784	0 1784	0 0
0 1784	0 1784	0 1784	0 0
892 3688	0 1784	0 1784	0 1784
892 6352	0 1784	0 1784	0 1784
0 0	0 1784	0 1784	0 3688

INITIAL SURVEY COMPLETED FEB. 12 & 16, 1988 USING GM COUNTER (TBM-28 #92238) CALIBRATED 11/13/87.
ALL VALUES ARE IN COUNTS PER MINUTE. BACKGROUND READING 80 PLUS OR MINUS 20 CPM.

INITIAL SURVEY NOTES:

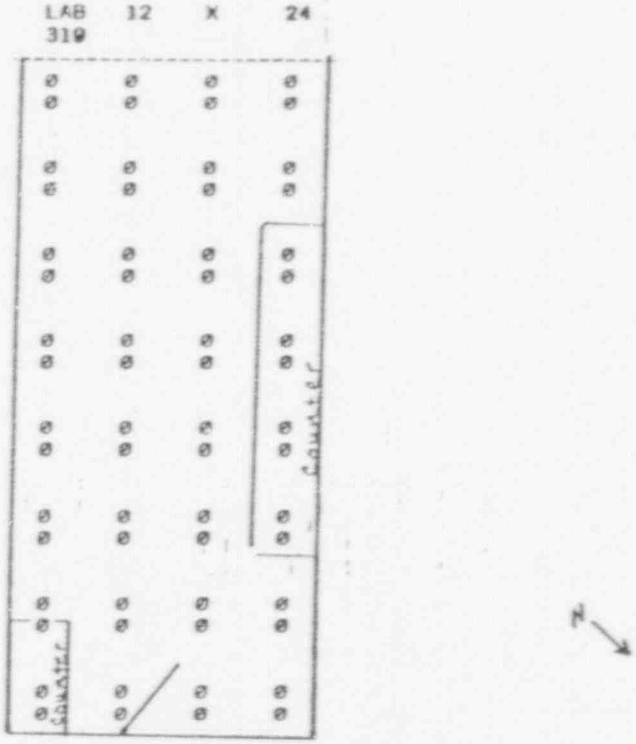
1. BOTH HOODS AND PLENUMS WERE NOT CONTAMINATED.
2. FLOOR DRAIN AND TILES UNDER CABINET REQUIRED DECONTAMINATION.
3. GAMMA SCANS SHOWED CONTAMINANT WAS PREDOMINANTLY CS-137.

FINAL SURVEY COMPLETED FEB. 23, 1988 USING GM COUNTER (TBM-28 92238) CALIBRATED 11/13/87.

FINAL SURVEY NOTES:

1. LEVELS WERE MEASURED ON TILE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN THE THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

ATTACHMENT 11: FINAL SURVEY OF LAB 319



0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0

FINAL SURVEY OF LAB 319 COMPLETED APRIL 21, 1988.
USING GM COUNTER (TBM-28 #9660) CALIBRATED MARCH 9, 1988.

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

ATTACHMENT 12 PAGE 1 OF 2
INITIAL SURVEY OF LABS 331 / 333

LAB 331	12	X	24	LAB 333	12	X	24
100 100	100 100	100 100	100 100	100 100	100 100	100 100	100 100
100 100	100 100	100 100	100 100	100 100	100 100	100 100	100 100
100 100	100 100	100 100	100 100	100 100	100 100	100 100	100 100
100 100	100 100	100 100	100 100	100 100	100 100	100 100	100 100
100 120	100 100	100 100	100 100	100 100	100 100	100 100	100 100
100 120	100 100	100 100	100 100	100 300	100 100	100 100	100 400
100 100	100 100	100 100	100 100	100 100	100 100	100 100	100 100
100 100	100 100	100 100	100 100	100 100	100 100	100 100	100 100

Counter

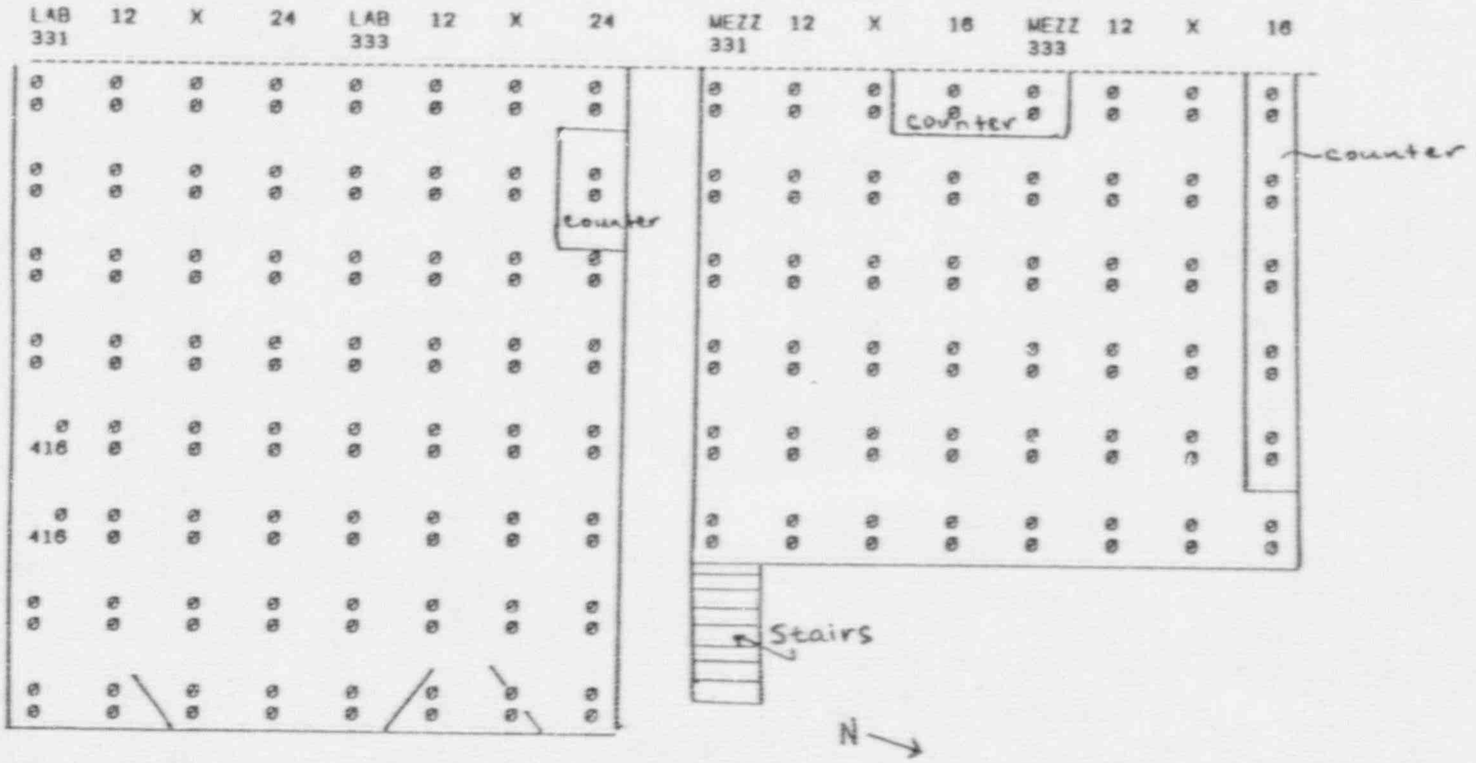
HOOD

N

INITIAL SURVEY NOTES:

1. INITIAL SURVEY WAS COMPLETED 4/4/88 USING GM COUNTER (TBM #92238) CALIBRATED 11/13/87.
2. GAMMA SCANS SHOWED THE CONTAMINANT WAS U-238.
3. HOOD AND DRAIN CLEANED TO RELEASE LEVELS.
4. TOP VALUE IS THE AVERAGE AND THE BOTTOM VALUE IS THE MAXIMUM LEVEL IN COUNTS PER MINUTE.
6. THE MEZZANINE WAS NOT CONTAMINATED.

ATTACHMENT 12 PAGE 2 OF 2
FINAL SURVEY OF LABS 331 / 333



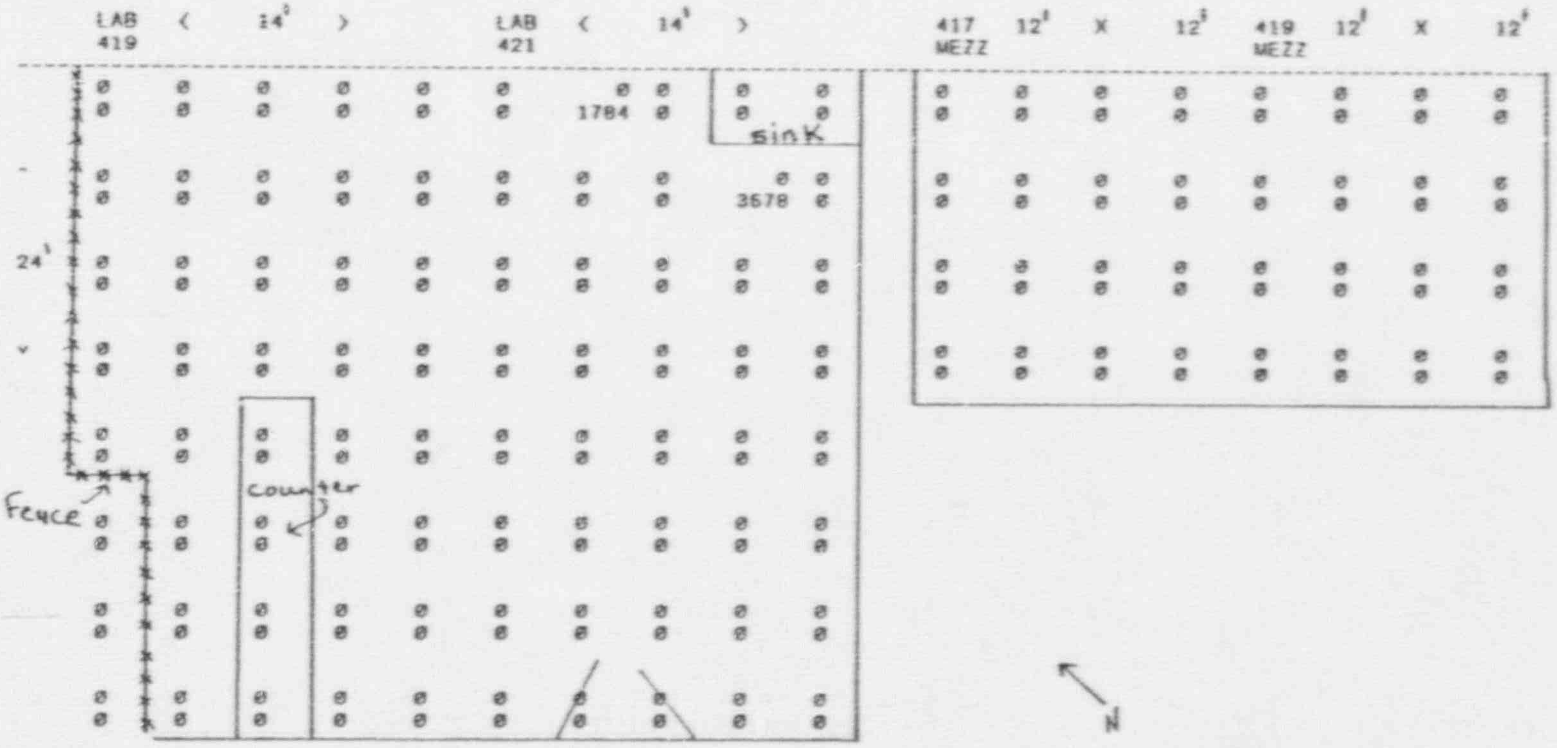
LAB 331	12	X	24	LAB 333	12	X	24
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 416	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 416	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

MEZZ 331	12	X	16	MEZZ 333	12	X	16
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

FINAL SURVEYS OF LABS 331/333 COMPLETED APRIL 8, 1988.
USING GM COUNTER (TBM-28 #92238) CALIBRATED 11/13/87.

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

ATTACHMENT 13: FINAL SURVEYS OF LABS 419/421 AND MEZZANINES 417/419



	LAB 419	<	14'	>		LAB 421	<	14'	>	
	0 0	0 0	0 0	0 0	0 0	0 0	0 1784	0 0	0 0	0 0
-	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 3678	0 0
24'	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
v	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

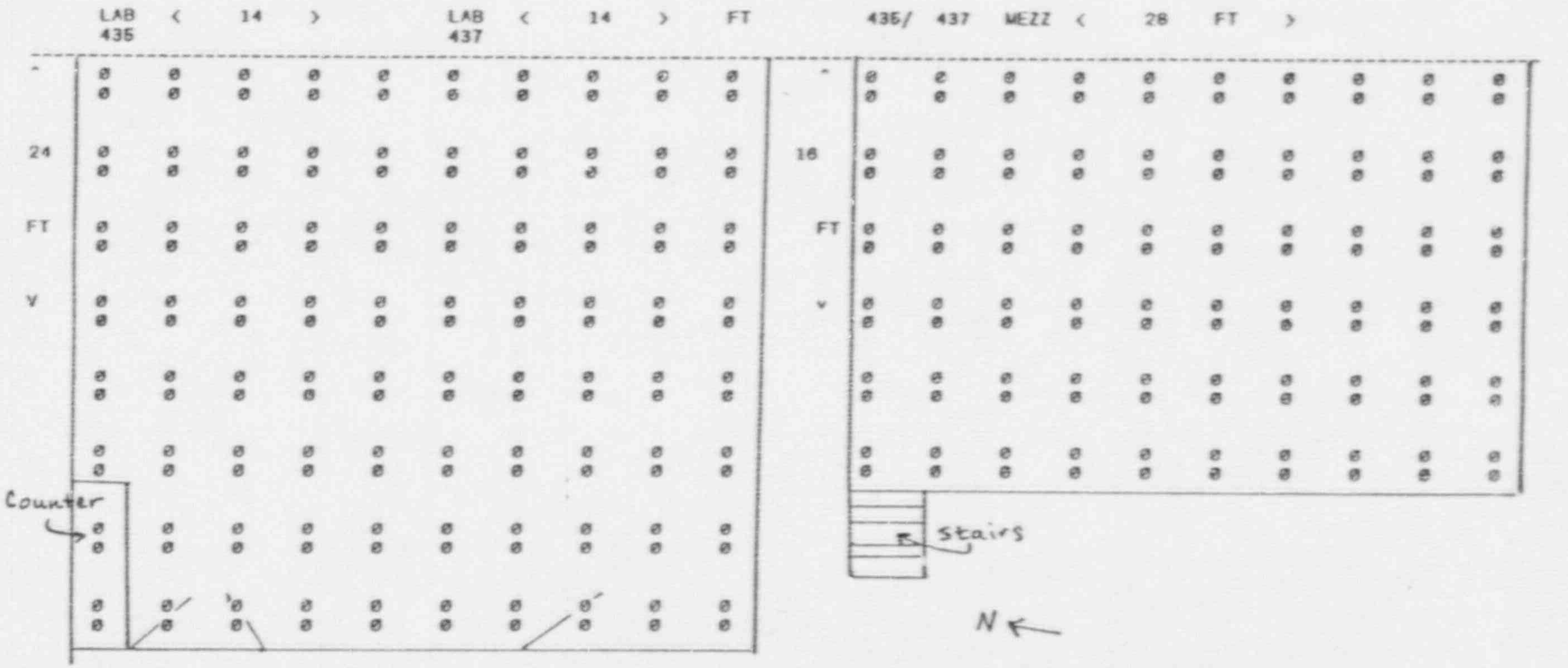
417 MEZZ	12'	X	12'	419 MEZZ	12'	X	12'
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

SURVEYS OF LABS 419/421 COMPLETED DECEMBER 21, 1987.
USING GM COUNTER (TBM-28 #92238) CALIBRATED 11/13/87.

LAB 417/419 MEZZANINE COMPLETED DECEMBER 21, 1987.
USING GM COUNTER (TBM-28 #92238) CALIBRATED 11/13/87.

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. Fence being replaced by wall.

ATTACHMENT 14: FINAL SURVEY OF LABS 435/437 AND MEZZANINE



LAB 435 < 14 > LAB 437 < 14 > FT

-	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
24	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
FT	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
v	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

435/ 437 MEZZ < 28 FT >

-	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
16	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
FT	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
v	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

FINAL SURVEYS OF LABS 435/437 COMPLETED MARCH 23, 1988.
USING GM COUNTER (TBM-28 #9660) CALIBRATED MARCH 9, 1988.

LABS 435/437 MEZZANINE FINAL SURVEY COMPLETED MARCH 18 AND MARCH 24
USING GM COUNTER (TBM-28 #9660) CALIBRATED MARCH 9, 1988.

NOTES:
1. LEVELS WERE MEASURED ON TILE OR CONCRETE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.

GENERAL ATOMICS

December 21, 1988
696-1318

Mr. Robert D. Thomas, Chief
Nuclear Materials Safety Section
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Subject: Docket 70-734: SNM-696; Request for Release of Selected Laboratories to Unrestricted Use (Group 3)

Dear Mr. Thomas:

General Atomics (GA) has been involved in the process of decontaminating and obtaining the release to unrestricted use of selected laboratories and associated offices in GA's Building 2 (also known as the Science Laboratories Building). Thirty-eight (38) such laboratories were released earlier this year in two groups designated as "Group 1" and "Group 2." Group 1 involved the release of 25 laboratories and Group 2 involved the release of 13 laboratories.

GA has recently decontaminated another group of laboratories in Building 2. This group consists of 15 laboratories (12 of these laboratories have mezzanines) and 9 other mezzanines located above laboratories which are not being released at this time. These latter laboratories are currently occupied; however, none of the activities involve the use of radioactive material. This group of laboratories and associated offices are designated as "Group 3." GA has no plans for conducting any future activities involving radioactive materials in the laboratories and/or mezzanines included in "Group 3" and would like to lease some, or all, of these laboratories to outside companies. The offices across the hall from these laboratories, which have never been used for work involving radioactive materials, may also be leased to outside companies. Accordingly, GA is requesting the release of these laboratories and/or mezzanines and their associated offices to unrestricted use.

To assist you in planning for the confirmatory survey and the subsequent release of the subject facilities to unrestricted use, the results of GA's final radiation and contamination surveys are provided in the enclosed report.

The 15 laboratories (12 have mezzanines) and 9 other mezzanines in "Group 3" consist of a total area of about 8,704 ft^2. A brief history of the use of these laboratories is provided. The primary radionuclides previously used in these laboratories were Cs-137, Co-60, u^{235}, depleted or natural uranium, and thorium. Only one laboratory (Lab 323) required decontamination beyond the removal, decontamination

IE07

DECONTAMINATION OF SELECTED GENERAL ATOMICS' SCIENCE LABORATORIES FOR RELEASE TO UNRESTRICTED USE

(Group 3)

December 21, 1988

of sources and contaminated equipment (including drain pipes, hoods, filter plenums and associated ducting). This involved the scabbling of about 20 ft^2 of concrete on the floor and the wall of Lab 323. The primary contaminants found during the decontamination efforts were Cs-137 and uranium (including U^{235}).

GA has decontaminated equipment and facilities consistent with the State of California's and U.S. Nuclear Regulatory Commission's guidelines for release of facilities and equipment to unrestricted use. The results of GA's final surveys (provided in the enclosed report) demonstrate compliance with these guidelines.

GA has tenants who are desirous of occupying the subject laboratories and associated offices as soon as they are released. It is, therefore, important to GA to obtain the requested release as soon as possible. Concurrent with submitting this request to you, we are making a similar request to the State of California Department of Health Services.

Approximately five rooms in GA's Experimental Building (i.e., Building 9) are also being decontaminated in preparation for release to unrestricted use. These rooms occupy an area where TRIGA fuel fabrication operations were performed prior to about 1976. A report documenting GA's final survey of this area is in preparation and will be sent to you in January 1989.

If you should have any questions regarding our request or the enclosed report, please contact me at (619) 455-2823.

Very truly yours,

Laura R. Quintana for

Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

KEA/mk
Enclosure

TABLE OF CONTENTS

LIST OF ATTACHMENTS

INTRODUCTION

General Atomics has been involved in the process of decontaminating and obtaining the release to unrestricted use of selected laboratories and associated offices in GA's Building 2 (also known as the Science Laboratories Building). Thirty-eight (38) such laboratories were released earlier this year in two groups designated as "Group 1" and "Group 2". Group 1 involved the release of twenty-five (25) laboratories and Group 2 involved the release of thirteen (13) laboratories.

GA has recently decontaminated another group of laboratories in Building 2. This group consists of fifteen (15) laboratories (12 of these laboratories have mezzanines) and nine (9) other mezzanines located above laboratories which are not being released at this time. These later laboratories are currently occupied; however, none of the activities involve the use of radioactive material. This group of laboratories and associated offices is designated as "Group 3". GA has no plans for conducting any future activities involving radioactive materials in these laboratories and/or mezzanines included in "Group 3" and would like to lease some, or all, of these laboratories to outside companies. The offices across the hall from these laboratories which have never been used for work involving radioactive materials may also be leased to outside companies. Accordingly, GA is requesting the release of these laboratories and/or mezzanines and their associated offices to unrestricted use.

The 15 laboratories (12 have mezzanines) and 9 other mezzanines in "Group 3" consist of a total area of about 8704 ft^2 to be released to unrestricted use. A brief history of the use of these laboratories is provided. The primary radionuclides previously used in these laboratories were Cs-137, Co-60, thorium and depleted, natural or enriched uranium. Only one laboratory (Lab 323) required decontamination beyond the removal/decontamination of sources and contaminated equipment (including drain pipes, hoods, filter plenums and associated ducting). This involved the scabbling of about 20 ft^2 of concrete on the floor and the wall of lab

323. The primary contaminants found during the decontamination efforts were Cs-137 and uranium (including U-235).

GA has decontaminated equipment and facilities consistent with the State of California's and U. S. Nuclear Regulatory Commission's guidelines for Release of Facilities and Equipment to Unrestricted Use.

The results of the final radiation and contamination surveys are included in this report to demonstrate compliance with the guidelines.

SITE DESCRIPTION

The location of Building 2 with respect to other facilities on the GA Site is shown in Attachment 1. A layout of Building 2 is shown in Attachment 2. The building is divided into three Laboratory sections; Laboratory B, C, and A. Laboratory B includes offices and laboratories from 102 through 243. Laboratory C includes offices and laboratories from 300 through 445 and Laboratory A includes offices and laboratories from 502 through 651. The laboratories and mezzanines to be released to unrestricted use in Group 3 are located in all three of the laboratory sections as shown in Attachment 3.

The fifteen (15) laboratories are 234, 321, 323, 327, 343, 345, 347, 425, 427, 429, 431, 433, 647, 649 and 651 and the 12 mezzanines above some of the labs which are also being released are 321, 323, 327, 343, 345, 347, 425, 427, 429, 431, 433, and 647. (Laboratories 234, 649 and 651 do not have mezzanines.) In addition, nine (9) other mezzanines are also being released in "group 3". These mezzanines are above labs 325, 335, 337, 339, 341, 349, 615, 617, and 645. The labs below these mezzanines are not being released to unrestricted use at this time because they are currently occupied. They are not being used for work involving radioactive materials and there are no plans to use radioactive materials in them in the future.

The approximate area in ft^2 is presented below:

Laboratory/Mezzanine	Approximate ft^2
Lab 234 (This lab does not have a mezzanine)	336
Lab 321/323 (Combined Labs)	552
Mezzanines above Labs 321/323/325/327	720
Lab 327	288
Labs 343/345 and Lab 347	864
Mezzanines above Labs 335/337/339/341/ 343/345/347 and 349	1440
Labs 425/427/429	1008
Mezzanines above Labs 425/427/429	504
Labs 431/433 (Combined Labs)	672
Mezzanines above Labs 431/433	448
Mezzanines above Labs 615/617	416
Labs 647, 649, 651 and Mezzanines 645/647 (Labs 649 and 651 do not have mezzanines)	1456
TOTAL	8704

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Table I (Attachment 4A) is taken from USNRC's criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into our SNM-696 license. The State of California's limits for release of facilities and equipment to unrestricted use are identical to these limits for the radionuclides of concern (predominantly U-238, Cs-137, U-235 and Co-60). These guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," are also known as "DECON-1" are summarized in Table I (Attachment 4B). GA has decontaminated the laboratories and selected mezzanines to levels below these guidelines.

INSTRUMENTATION AND MEASUREMENT LIMITS FOR RELEASE

Instrumentation

1. Beta/gamma counters - Model TBM 28 geiger counters manufactured by Technical Associates were used to survey surfaces for beta/gamma contamination. The instruments contain a pancake Geiger-Mueller (GM) detector which has a window thickness of less than 7 mg/cm^2. The instrument has three ranges covering from 0-50,000 counts per minute (cpm). The instruments are calibrated semiannually using a Cs-137 standard or a pulser.

2. Alpha counters - Model 12 rate meters with Model 43-44 air proportional alpha probes manufactured by Ludlum Measurements Inc. were used to survey for alpha contamination. The instrument has four ranges covering from 0-500,000 counts per minute. Alpha counters are calibrated using an alpha source traceable to NBS.

3. Gamma Detectors - Model 19 microR meters with NaI scintillation detectors manufactured by Ludlum Measurements Inc. were used in all locations. The instrument has three ranges from 0 - 5 mR/hr. The microR meters are normally returned to the manufacturer for calibration annually. Gamma spectral analysis on selected samples were performed using a high purity germanium detector manufactured by Canberra Industries, Inc.

4. Low level Alpha/Beta counting systems manufactured by Canberra were used to analyze wipe samples.

The alpha/beta systems and the germanium detector system has been calibrated for various type of samples. This calibration is checked on a daily or weekly basis depending on usage.

Measurement Limits for Release

The final survey results have been converted from cpm (counts per minute) for a particular detector to dpm/100 cm^2 by correcting the counts per minute observed by an appropriate detector for background, detector efficiency and geometric factors associated with the instrumentation.

1. Background

A "standard" natural background was determined for each instrument and subtracted from the survey readings. The surface beta/gamma readings were completed using the TBM Model 28 GM counters which have a background concrete reading of 80 plus or minus 20 counts per minute.

2. Efficiency

The primary contaminants found during the decontamination efforts were Cs-137 and uranium.

Only one laboratory (Lab 323) required decontamination beyond the removal/decontamination of sources and contaminated equipment (including hoods and associated ducting and filter plenums). The concrete floor of lab 323 was found to be contaminated with Cs-137. An area of about 20 ft^2 was scabbled until the contamination levels met the release criteria in Table 1 (Attachments 4A and 4B). An NBS traceable standard was used to calibrate instruments for Cs-137 efficiencies. The standard consisted of a concrete block having an area of approximately 25 cm x 25 cm spiked with an NBS traceable standard liquid solution of Cs-137. The maximum allowable level is 15,000 dpm for an area less than 100 cm^2 and the average allowable level for an area 1 meter by 1 meter of less is 5000 dpm/100 cm^2 (Attachments 4A and 4B). Surface measurements of the blocks were obtained with the instruments and percent efficiencies were obtained. The readings were corrected for efficiency by multiplying by the appropriate correction factor.

The hood in laboratory 433 was contaminated with uranium (including U-235) and was cleaned to background levels (background levels of both beta/gamma and alpha detecting instruments). Therefore, instrument efficiencies were not needed.

3. Geometry Correction

The values listed in Table 1 are in dpm/100 cm^2, therefore, a correction factor was applied to the values to correct for the smaller area of the detector for the Cs-137 contaminated areas. The TBM-28 (geiger counter) has a 5 cm diameter detector which measures a 19.6 cm^2 area. The reading is corrected by multiplying by 5.1.

PREVIOUS LABORATORY ACTIVITIES AND EFFORT OF DECONTAMINATION REQUIRED

Initial Survey

An initial beta/gamma survey was conducted during and after the removal of all equipment (including the hood, filters, plenums and associated ducting) to determine the extent of the remaining contamination and the radionuclides present.

These surveys indicated that only one laboratory (lab 323) was contaminated beyond the removal of sources and equipment (including drain pipes, hoods, filters plenums and associated ducting).

The total area of these laboratories is 8704 ft^2 but only about 20 ft^2 required decontamination beyond the cleanup of hoods and removal of all contaminated equipment.

The cleanup effort involved washing of floors, removal of floor tiles, removal or cleanup of hoods, associated plenums and ducting and the scabbling of about 18 ft^2 of concrete on the floor and about 2 ft^2 of concrete brick from the wall of lab 323.

Every reasonable effort was made to eliminate residual contamination. No covering was applied to the contaminated surfaces of equipment or structures such as paint, plating etc. The floors of all the other laboratories were washed, surveyed and found to be free of contamination.

A brief description of the previous use of the 13 laboratories over the past approximately 20 years is provided below.

Lab 234 (Lab does not have a mezzanine)

This lab had been used for X-Ray diffraction of samples containing Uranium and Thorium as well as for X-ray diffraction of samples containing up to 1 mCi of mixed fission products. The samples were prepared in other radiochemistry laboratories and then transferred to this laboratory for X-ray diffraction. No contamination was detected in this laboratory.

Labs 321 and 323

These laboratories had been used for work involving mixed fission products many years ago. After the removal of all sources and contaminated equipment, an initial survey was completed (See Attachment 6). All values are provided in cpm (beta/gamma contamination) using a technical associates model TBM-28 GM counter. Contamination was found on the floor and one wall of laboratory 323. Gamma scans of concrete chips removed from the floor showed Cs-137 to be the only contaminant. The floor was cleaned and an area (about 20 ft^2) was scabbled until the contamination levels met the release criteria in Table 1 (Attachments 4A and 4B). The mezzanines had no contamination but a few radioactive samples (i.e. metal, plastic) were disposed of as radioactive waste during clean up of the lab.

Lab 327

No record of work involving radioactive material exists for this lab. No contamination was detected.

Mezzanines above Labs 325 and 327

Ducts in the mezzanine above laboratory 327 were labeled "Caution Radioactive Material" but no contamination was detected. The ducts were removed and released to unrestricted use. There were no records of any Work Authorizations for this laboratory. No contamination was detected.

Labs 343/345 and Lab 347 and Mezzanines above Labs 335, 337, 339, 341, 343, 345 and 347

Work involving radioactive material has not been conducted in these laboratories since 1974 at which time a Work Authorization for X-ray analysis of samples containing uranium and thorium was in existence for laboratory 339. The X-ray machine was located in the lab 335 mezzanine but did not appear to have been operated. The X-ray machine is currently being stored in another facility.

During the surveys a few items were found to be contaminated. In the mezzanine above lab 341, a part used for a milling machine had contamination up to 300 counts per minute (GM reading). The part was transferred to the Hot Cell Facility. A bottle of thorium was found in lab 343 and was transferred to the radiochemistry laboratories. In addition, a sheet of material containing thorium was found in the service core cabinet and disposed of as radioactive waste. No contamination was detected on the floors or walls of these laboratories and/or mezzanines.

Labs and Mezzanines above labs 425, 427, and 429

Between 1974 and 1976, tests of the thermal and physical properties of fuel particles were conducted in these labs. In 1977, densitometry of fuel rods was also conducted. An isolated plenum in laboratory 429 was found to have minor contamination on the door gaskets. These gaskets were removed and disposed of as radioactive waste. The plenum and associated ducting were not contaminated but were removed and transferred to another location. An internally contaminated drain pipe which had been capped off on both ends was also removed and disposed of as radioactive waste. Minor decontamination of the floor was required following removal of the drain pipe. The contaminants were not identified but the floor was immediately cleaned to background levels.

Labs 431/433 and Mezzanines above the labs

Until a few months ago, these laboratories had been used for fuel development work. Uranium of varying enrichments, thorium, and small amounts of mixed fission products were used in these laboratories. After removal of all sources and contaminated equipment a survey showed only the hood in Lab 433 was contaminated with uranium (including U-235). The hood was cleaned to background levels.

Mezzanines above labs 615 and 617

There was no record of radioactive material use for these labs/mezzanines over the past 20 years. No contamination was detected.

Laboratories 647, 649, and 651 and Mezzanine 645/647

There was no record of radioactive material use for these labs/mezzanines over the past 20 years. No contamination was detected.

FINAL RADIATION SURVEYS

Final surveys of all laboratories and selected mezzanines were conducted using the TBM-28 GM counters. The measurements of average contamination were averaged over 1 meter^2 and are given in dpm/100 cm^2. The maximum contamination level applies to an area of not more than 100 cm^2. The results of these surveys are shown in Attachments 5 through 17 as described below.

Attachment 5: Final Radiation Survey of Lab 234
Attachment 6: Initial Survey of Combined Labs 321/323
Attachment 7: Final Survey of Combined Labs 321/323
Attachment 8: Final Survey of Combined Mezzanines above Labs 321/323/325/327
Attachment 9: Final Survey of Lab 327
Attachment 10: Final Survey of Combined Labs 343/345 and Lab 347
Attachment 11: Final Survey of Combined Mezzanines above Labs 335, 337, 339, 341, 343, 345, 347 and 349
Attachment 12: Final Survey of Combined Labs 425/427/429

Attachment 13: Final Survey Combined Mezzanines above Labs 425, 427, and 429
Attachment 14: Final Survey of Combined Labs 431/433
Attachment 15: Final survey of Combined Mezzanines above Labs 431 and 433
Attachment 16: Final Survey of Combined Mezzanines above labs 615/617
Attachment 17: Final Survey of Labs 647, 649, 651 and combined Mezzanines above labs 645 and 647

A microR meter was also used to survey the laboratories and to measure radiation levels. The final surveys show the measurements obtained at one meter above the surface. These levels were all within normal background levels.

Alpha counters were also used to survey the laboratories. The beta/gamma levels were used to determine allowable release levels for the Cs-137 contaminated areas and the uranium contaminated areas were cleaned to beta/gamma and alpha background levels.

FINAL CONTAMINATION SURVEYS

Table 1 (Attachments 4A and 4B) provides limits for acceptable removable surface contamination levels. Although the type of decontamination efforts (i.e. washing, scabbling and vacuuming) conducted in these laboratories eliminates the probability of removable contamination, a wipe survey was conducted. These wipes were collected primarily on the floors of the laboratories. The wipe sample locations are shown in Attachments 5 through 17 and the results are shown in Attachment 18. The contamination levels in every location were < 20 dpm/100 cm^2 area, and well below the Table 1 limits (Attachment 4A and 4B) for removable contamination.

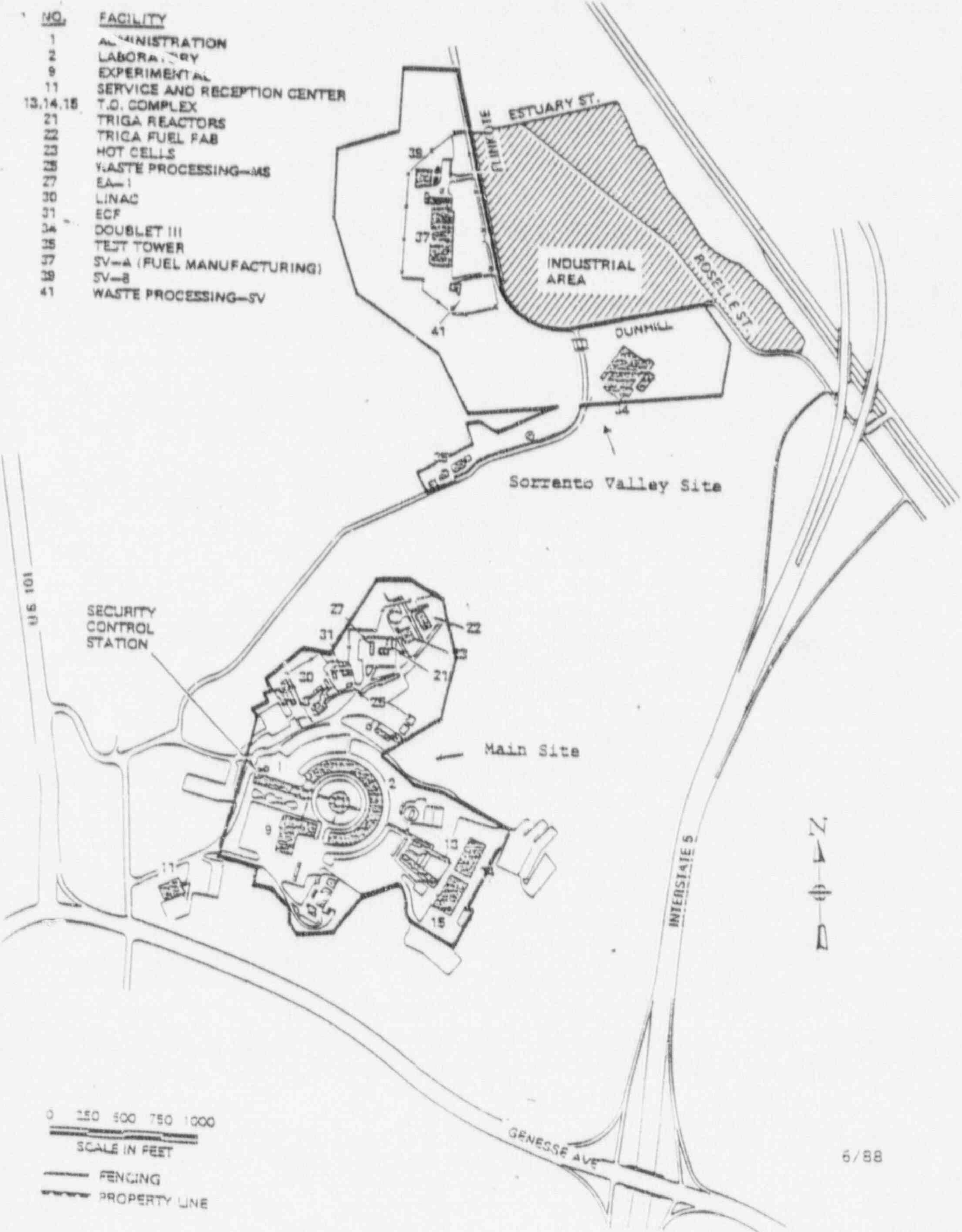
COMPLIANCE WITH THE TARGET CRITERIA

The laboratories were cleared of all radioactive materials and contaminated equipment. Drain lines, hoods, filter plenums and associated ducting was either decontaminated to natural background levels or disposed of as radioactive waste.

All floors, walls and concrete surfaces were also decontaminated below the release levels specified in Table 1 (Attachment 4A and 4B). The final surveys provided in this report demonstrate compliance with the criteria for release to unrestricted use.

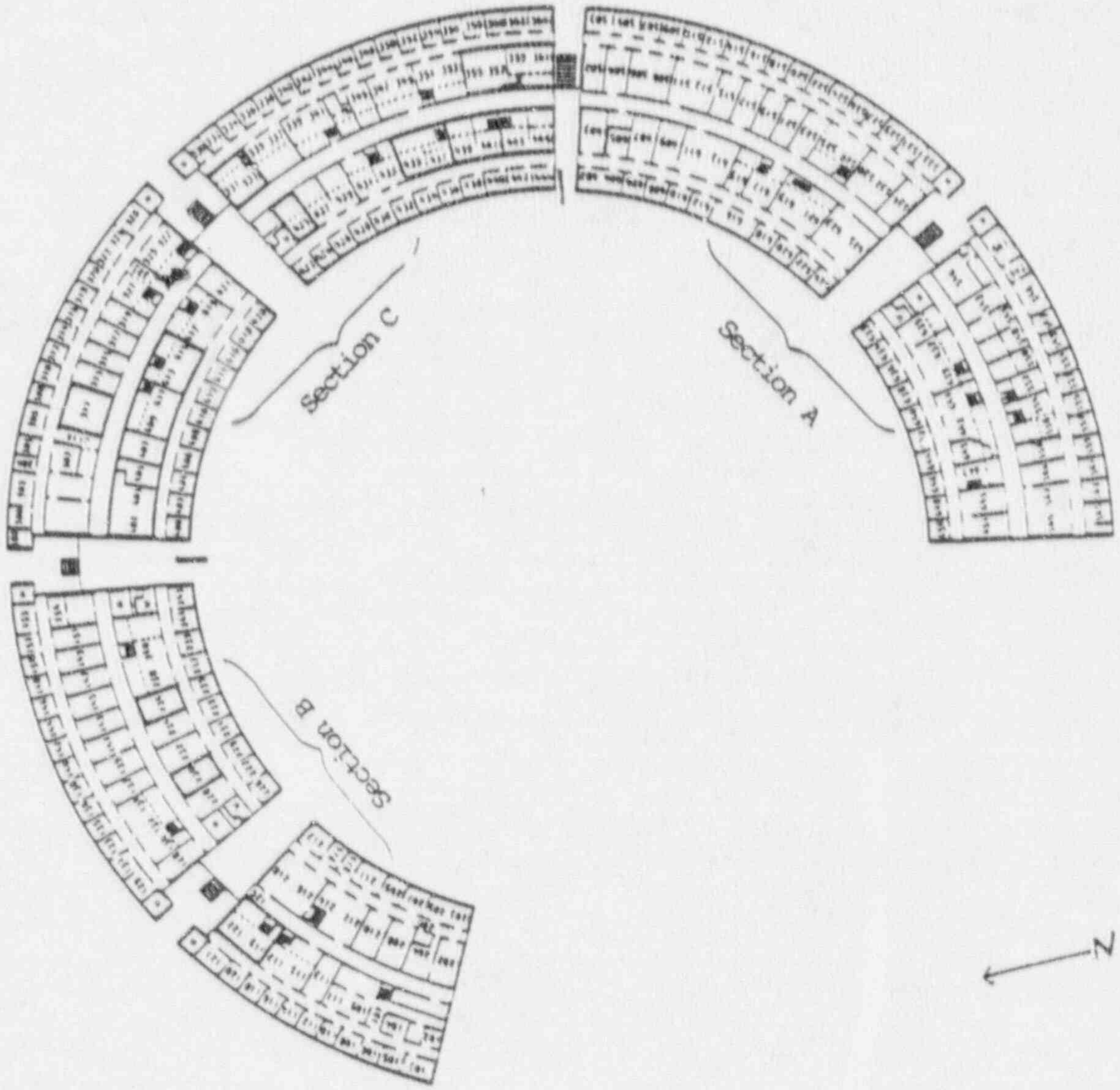
CONCLUSION

The above described 15 labs (12 of which have mezzanines) and 9 other mezzanines (labs below these mezzanines are not included) have been cleared for release to unrestricted use. Final contamination and radiation surveys show the levels meet the guidelines for release to unrestricted use.

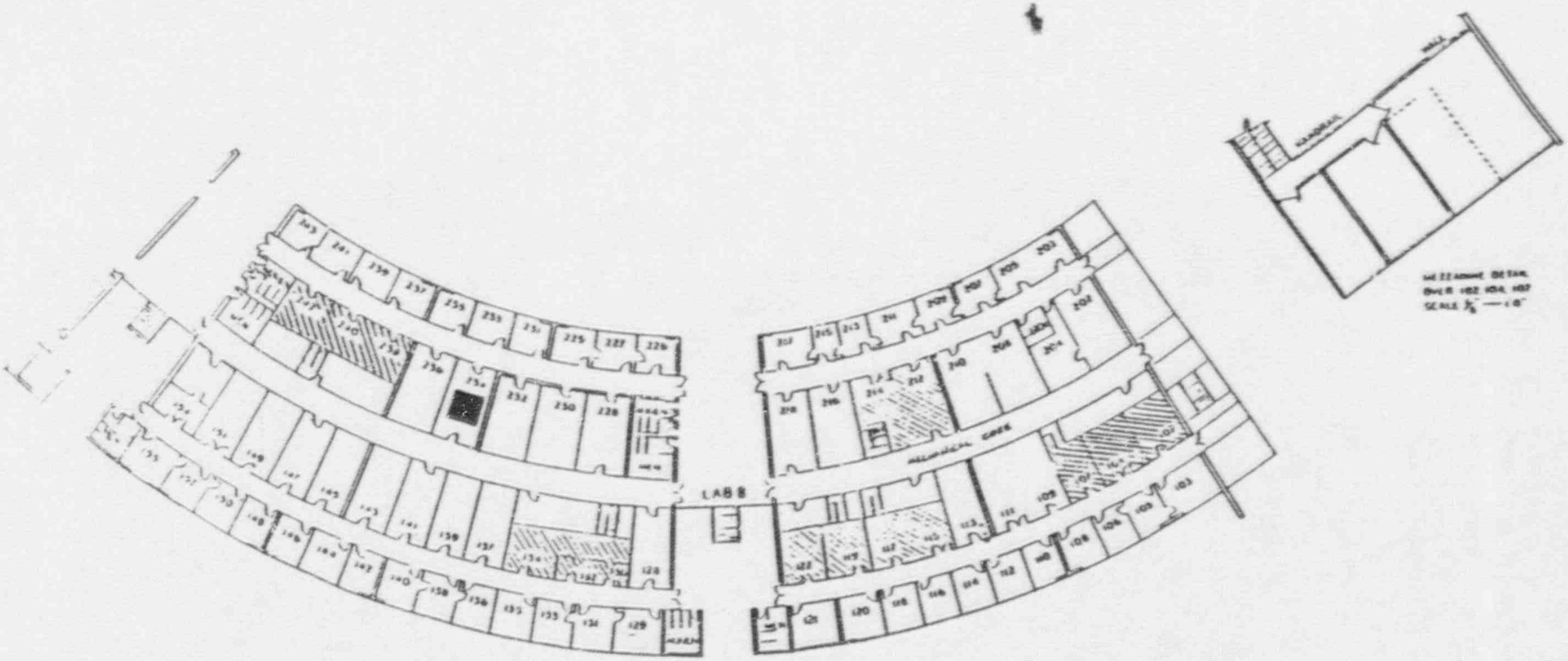


NO.	FACILITY
1	ADMINISTRATION
2	LABORATORY
9	EXPERIMENTAL
11	SERVICE AND RECEPTION CENTER
13,14,15	T.O. COMPLEX
21	TRIGA REACTORS
22	TRICA FUEL FAB
23	HOT CELLS
25	WASTE PROCESSING—MS
27	EA—1
30	LINAC
31	ECF
34	DOUBLET III
35	TEST TOWER
37	SV—A (FUEL MANUFACTURING)
39	SV—B
41	WASTE PROCESSING—SV

Attachment 1: Plan View of Sites



Attachment 2: L Building Complex (Building 2)



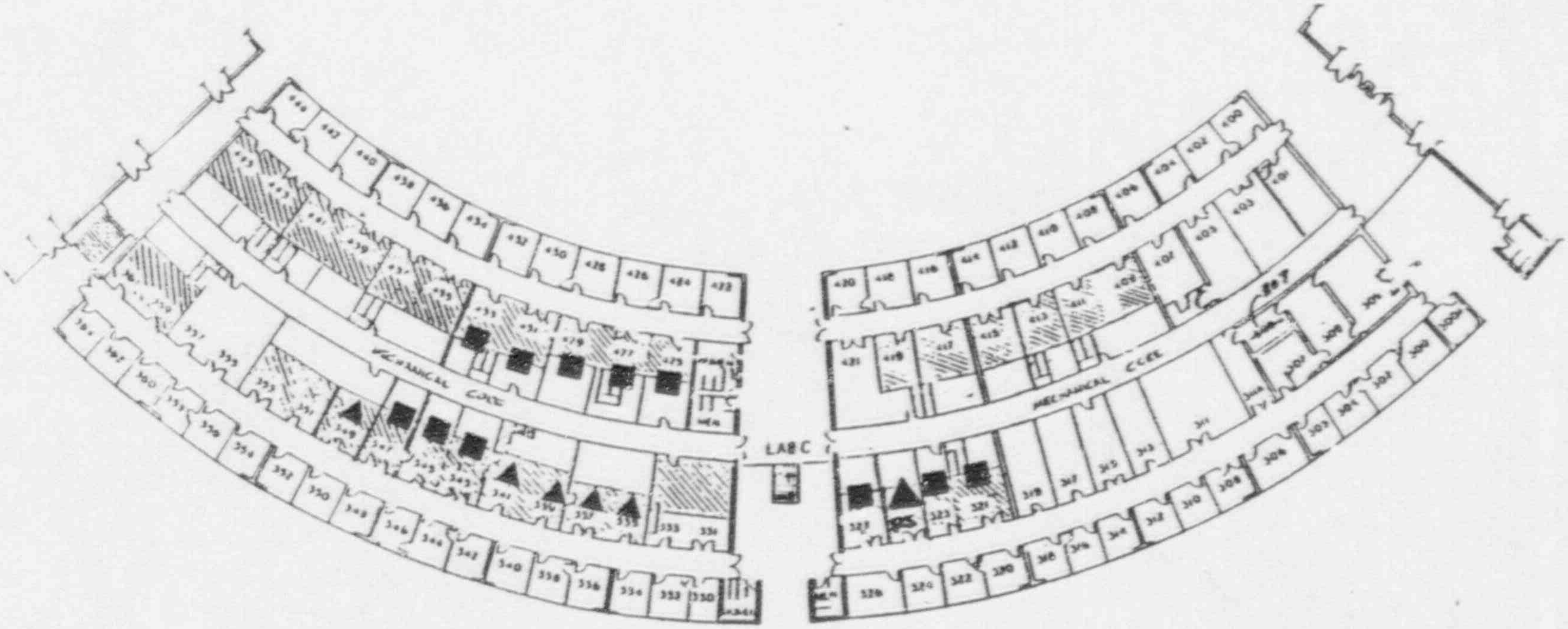
■ Labs to Be Released (and mezzanines, if any)

▲ Only mezzanines to be released.

LABORATORY B
BUILDING 2

M MEZZANINE

Attachment 3: Labs and/or Mezzanines to be Released to Unrestricted Use

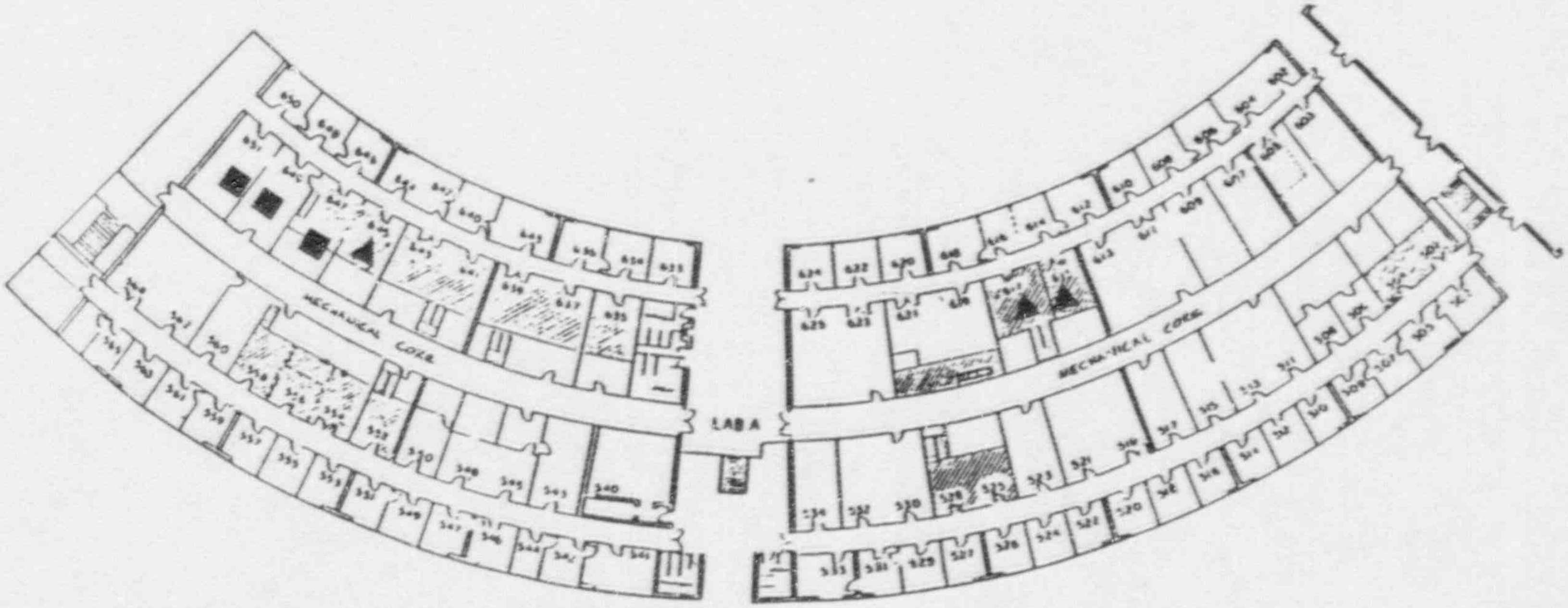


▲ Labs to be released (and mezzanines, if any).

LABORATORY C BUILDING 2

▲ Only mezzanines to be released.

Attachment 3: Labs and/or Mezzanines to be Released to Unrestricted Use



■ Labs to be released (and mezzanines, if any)

▲ Only mezzanines to be released.

LABORATORY A BUILDING 2

ATTACHMENT 4A

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES[a]	AVERAGE[b c f]	MAXIMUM[b d f]	REMOVABLE[b e f]
nat, U-235, U-238, and sociated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
ansuranics, Ra-226, Ra-228, -230, Th-228, Pa-231, -227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
-nat, Th-232, Sr-90, -223, Ra-224, U-232, I-126, 131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
ta-gamma emitters (nuclides th decay modes other than lpha emission or spontaneous ssion) except Sr-90 and thers noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

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here surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emittin nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm^2.

The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

ATTACHMENT 4B

TABLE I
ACCEPTABLE SURFACE CONTAMINATION LEVELS1/2/

NUCLIDE[a]	AVERAGE[b c] (dpm/100 cm^2)	MAXIMUM[b d] (dpm/100 cm^2)	REMOVABLE[b e] (dpm/100 cm^2)
a) U-nat, U-235, U-238, and associated decay products	5,000	15,000	1,000
b) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231 Ac-227, I-125, I-129	100	300	20
c) Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
d) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
e) H-3, C-14 except as DNA precursors f/	20,000	60,000	4,000

Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm^2.

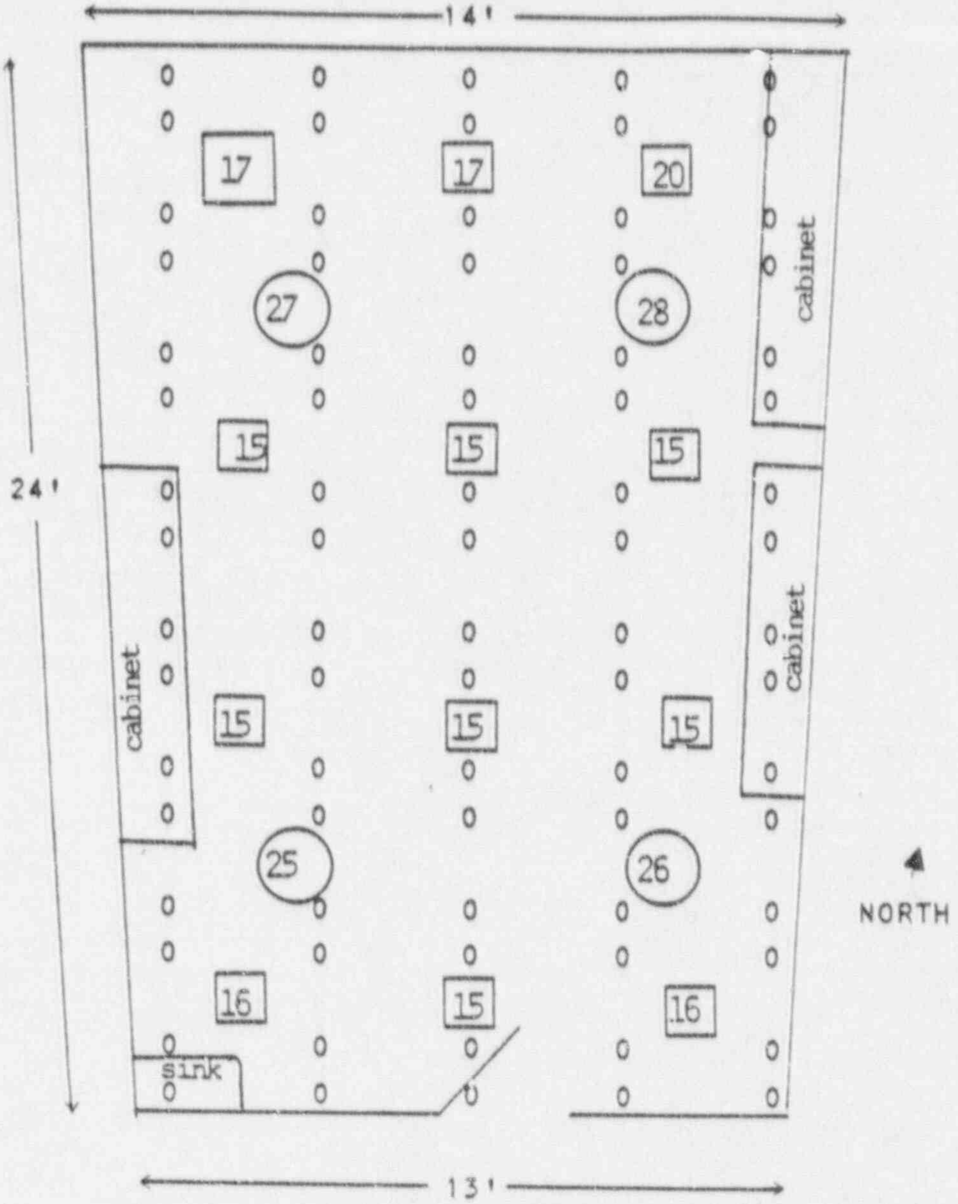
The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

DNA precursors mean molecules or compounds that are directly incorporated into the DNA molecule during DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and nucleosides. The acceptable surface contarination levels for H-3 and C-14 in DNA precursors are as tabulated in paragraph (d) for beta-gamma-emitters.

USNRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, Washi[illegible] D.C. (June 1974)

/ ANSI, Control of Radioactive Surface Contamination on Materials, Equipment and Facilities To Be Released for Uncontrolled Use, Final Draft, proposed American National Standard N-328, Atomic Industrial Forum, Inc., N.Y. (June 1[illegible]4)

ATTACHMENT 5: FINAL SURVEY OF Lab 234



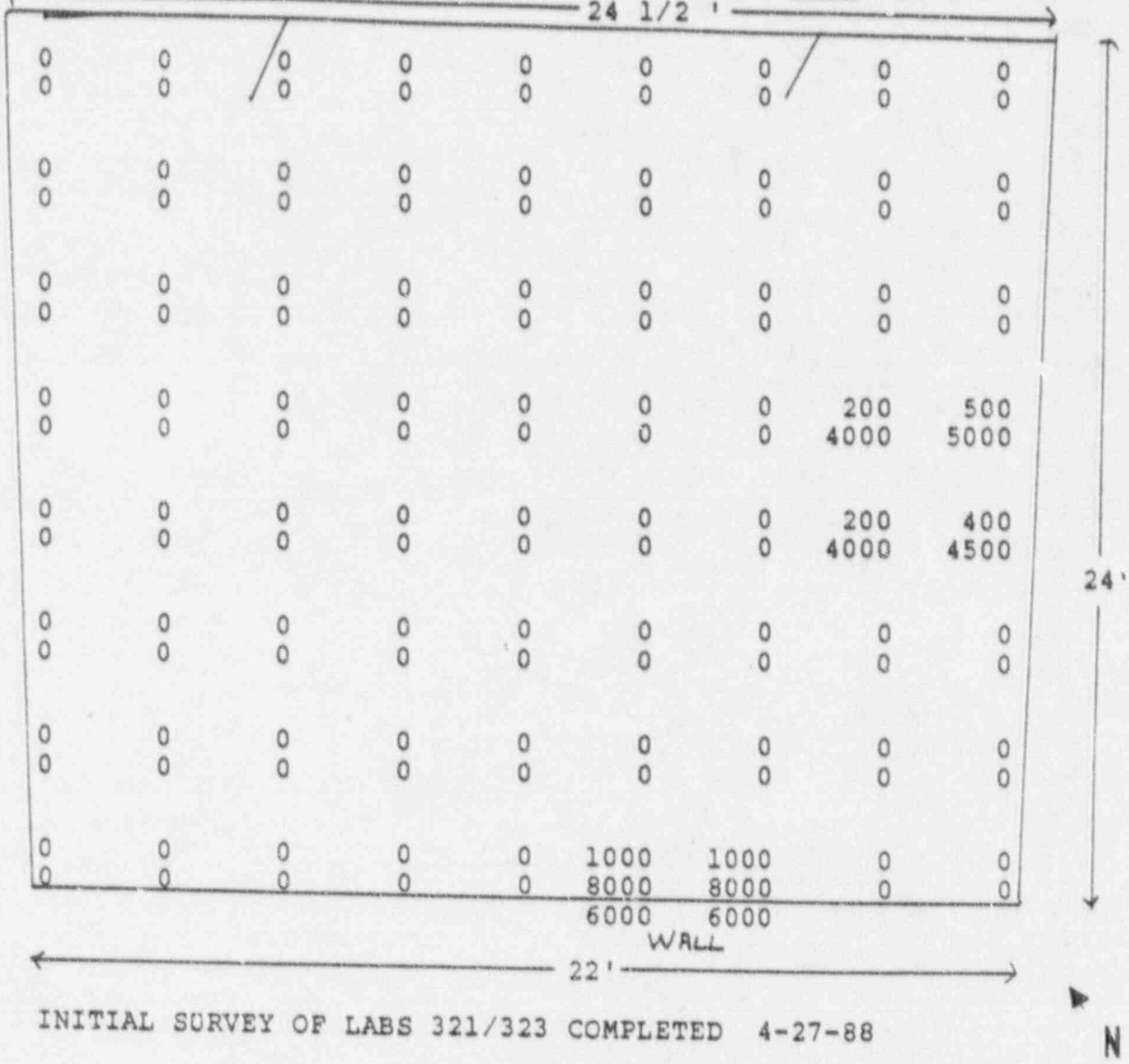
FINAL SURVEY OF LAB 234 COMPLETED 8-25-88

Instruments used were: Ludlum 19 microR meter #33545 calibrated 2-29-88 and geiger counter TBM-28 #2759 calibrated 6-24-88.

1. Each unit represents a three foot by three foot area or less.
2. Top value is the average beta/gamma contamination in DPM/100 cm square in a three foot by three foot area or less.
3. Bottom value is the maximum beta/gamma contamination in DPM for an area <100 cm square.
4. Circled numbers are wipe locations.
5. Numbers in squares are measured microR/hr levels.
6. No contamination was detected on floors or walls in this lab.

ATTACHMENT 6:

INITIAL SURVEY OF COMBINED LABS 321/323



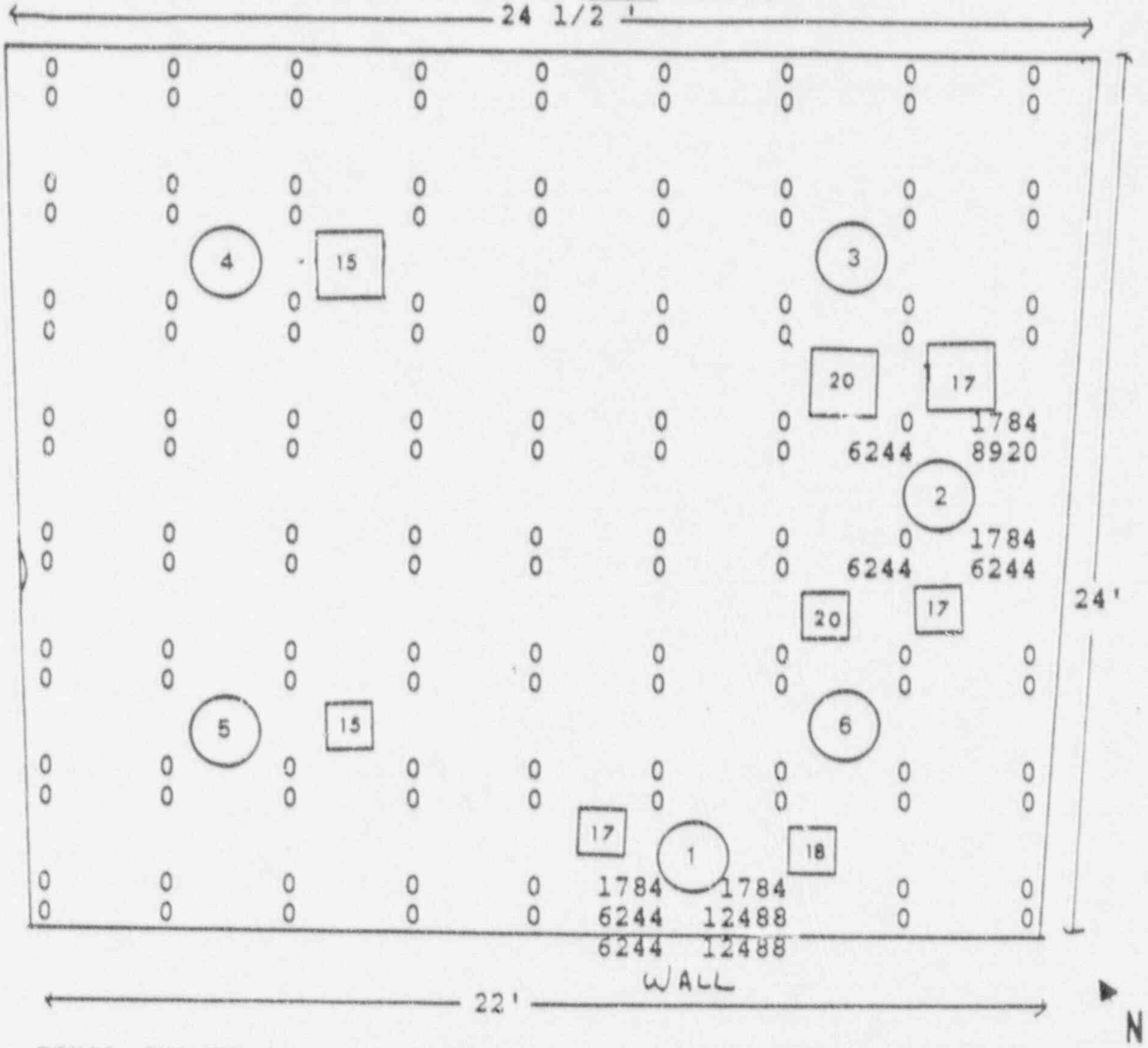
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	200 4000	500 5000
0 0	0 0	0 0	0 0	0 0	0 0	0 0	200 4000	400 4500
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
0 0	0 0	0 0	0 0	0 0	1000 8000 6000	1000 8000 6000	0 0	0 0

INITIAL SURVEY OF LABS 321/323 COMPLETED 4-27-88

INSTRUMENTS USED WERE: Ludlum 19 #33545, Calibrated 2-16-88
Ludlum 12 #46465, Calibrated 11-10-87
TBM-28 #92238, Calibrated 4-21-88

1. Levels were measured on tile and concrete floor
2. Each unit represents a three foot by three foot area or less.
3. Top value is the maximum net CPM with TBM-28 on floor tiles.
4. Bottom value is the maximum net CPM on concrete under floor tiles.
5. The maximum net CPM for a small area (2 square feet) of the lower wall is also indicated. No other areas of the walls were contaminated.
6. No contamination was detected in the mezzanines above these labs.

ATTACHMENT 7: FINAL SURVEY OF LABS 321/323

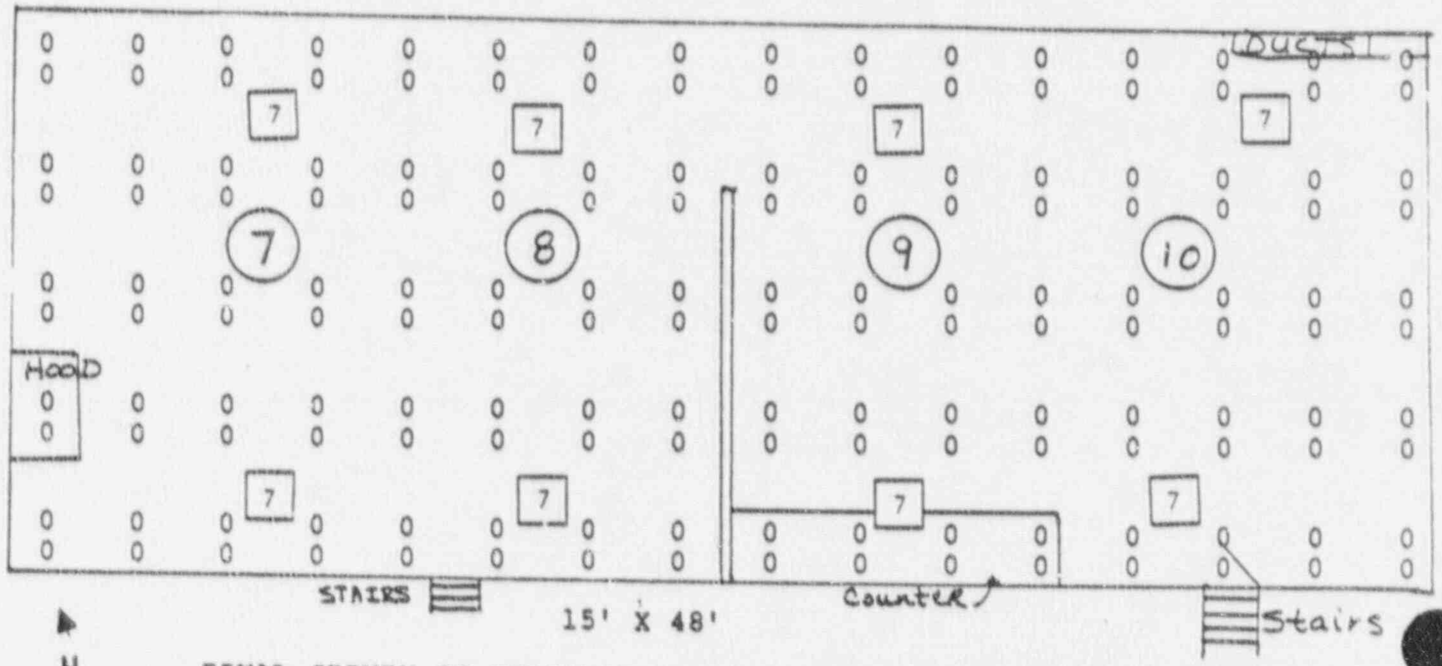


FINAL SURVEY OF LABS COMPLETED 4/25/88, 4/28/88 AND 4/29/88

INSTRUMENTS USED WERE: Ludlum 19 #33545, Calibrated 2-16-88
Ludlum 12 #46465, Calibrated 11-10-87
TBM-28 #92238, Calibrated 4-21-88

1. Levels were measured on tile or concrete floor after cleaning or scabbling.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma cortamination in DPM/100 cm sq in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm sq.
5. Circled numbers are wipe locations.
6. Numbers in squares are microR/hr surface levels.
7. Approximately 20 ft^2 of concrete required scabbling.

ATTACHMENT 8:
FINAL SURVEY OF COMBINED MEZZANINE ABOVE LABS 321, 323, 325, AND 327



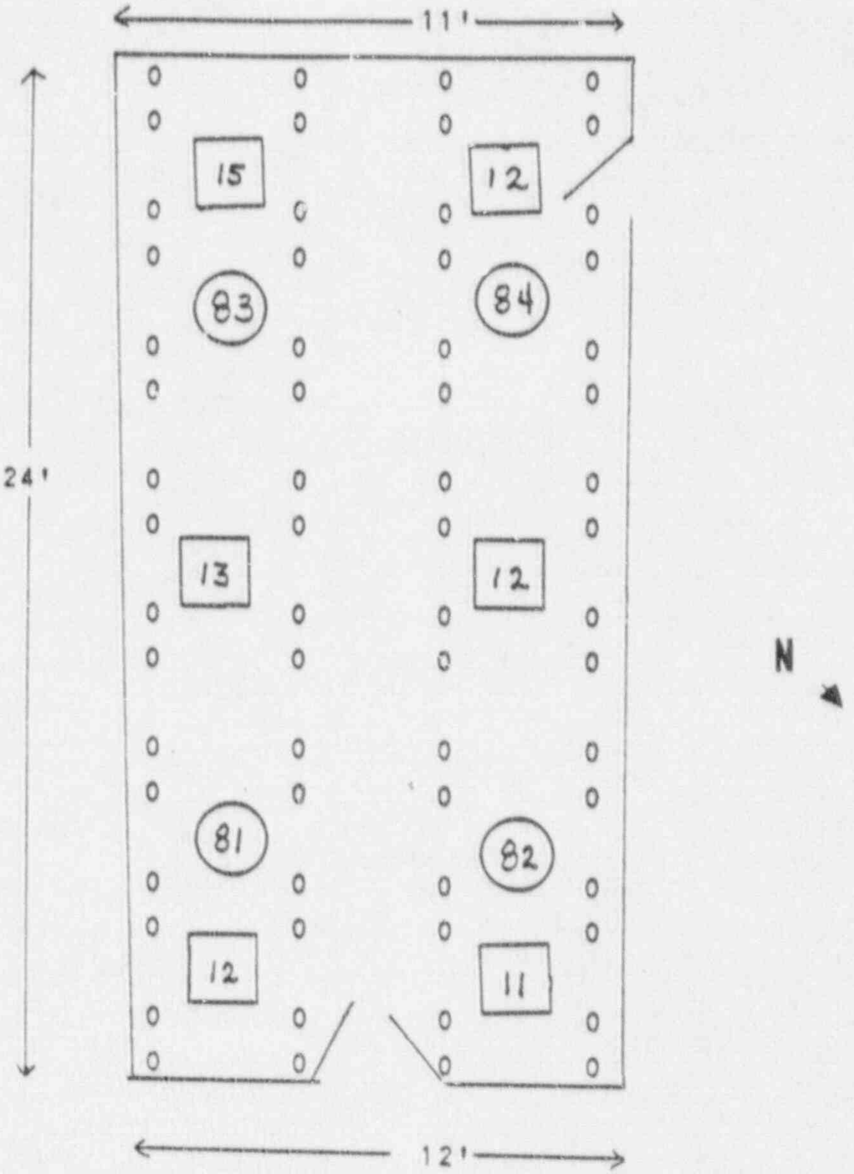
FINAL SURVEY OF MEZZANINES ABOVE LABS COMPLETED ON 4/25/88 AND 4/27/88

INSTRUMENTS USED WERE:

Ludlum 19 #33545, Calibrated 2-16-88
Ludlum 12 #46465, Calibrated 11-10-87
TBM-28 #92238, Calibrated 4-21-88

1. Levels were measured on floor tile.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm sq in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm sq.
5. Circled numbers are wipe locations.
6. Numbers in squares are microR/hr readings.
7. No contamination was detected; No cleaning was required.

ATTACHMENT 9: FINAL SURVEY OF LAB 327

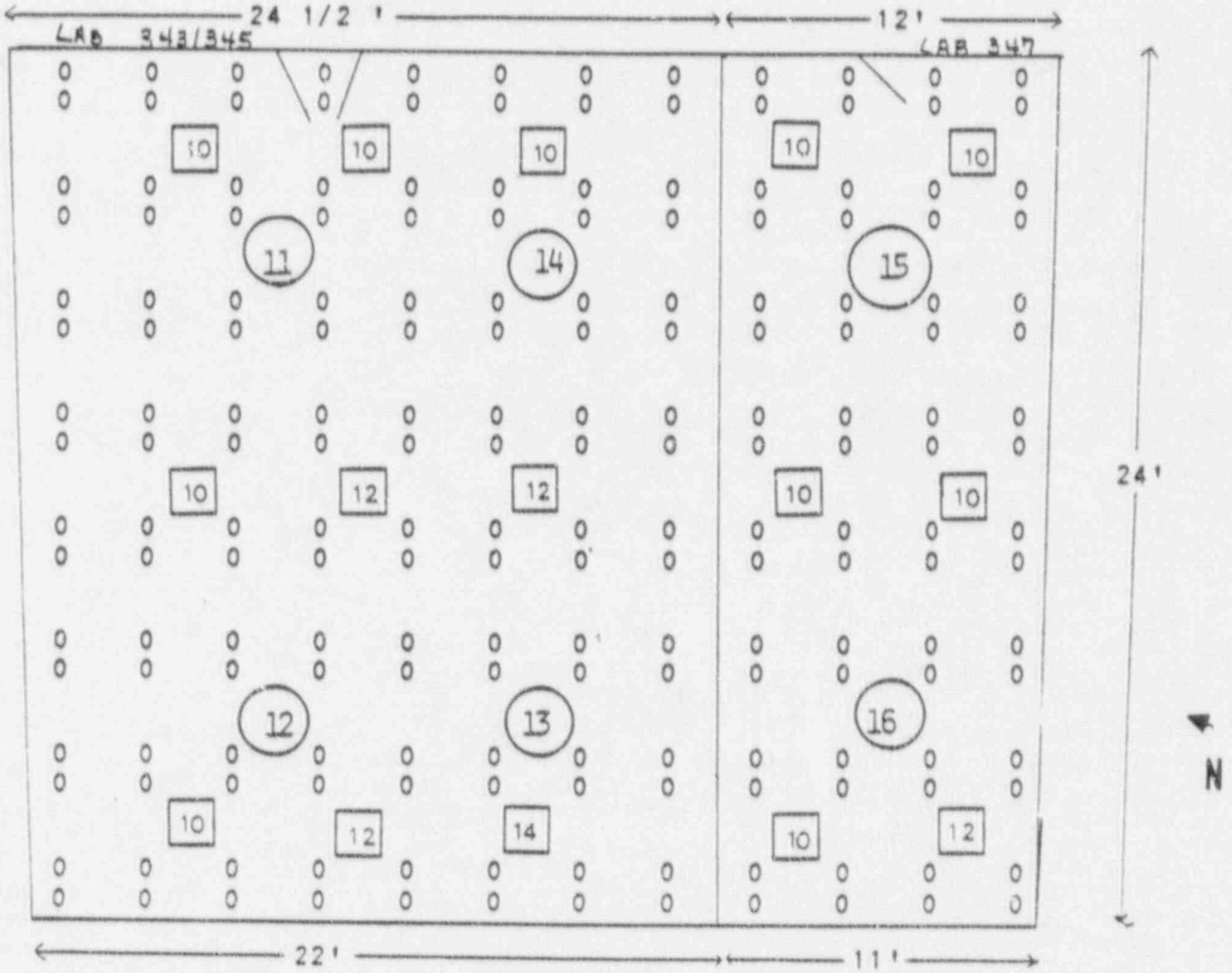


FINAL SURVEY COMPLETED 11-11-88

Instruments used were: Ludium 19 microR meter #33545 calibrated 11-11-88, and geiger counter TBM-28 #108113 calibrated 10-31-88.

1. Each unit represents a three foot by three foot area or less.
2. Top value is the average beta/gamma contamination in DPM/100 cm square in a three foot by three foot area or less.
3. Bottom value is the maximum beta/gamma contamination in DPM for an area <100 cm square.
4. Circled numbers are wipe locations.
5. Numbers in squares are measured microR/hr levels.
6. No contamination requiring cleanup was detected in this lab.

ATTACHMENT 10: FINAL SURVEY OF COMBINED LABS 343/345, AND LAB 347



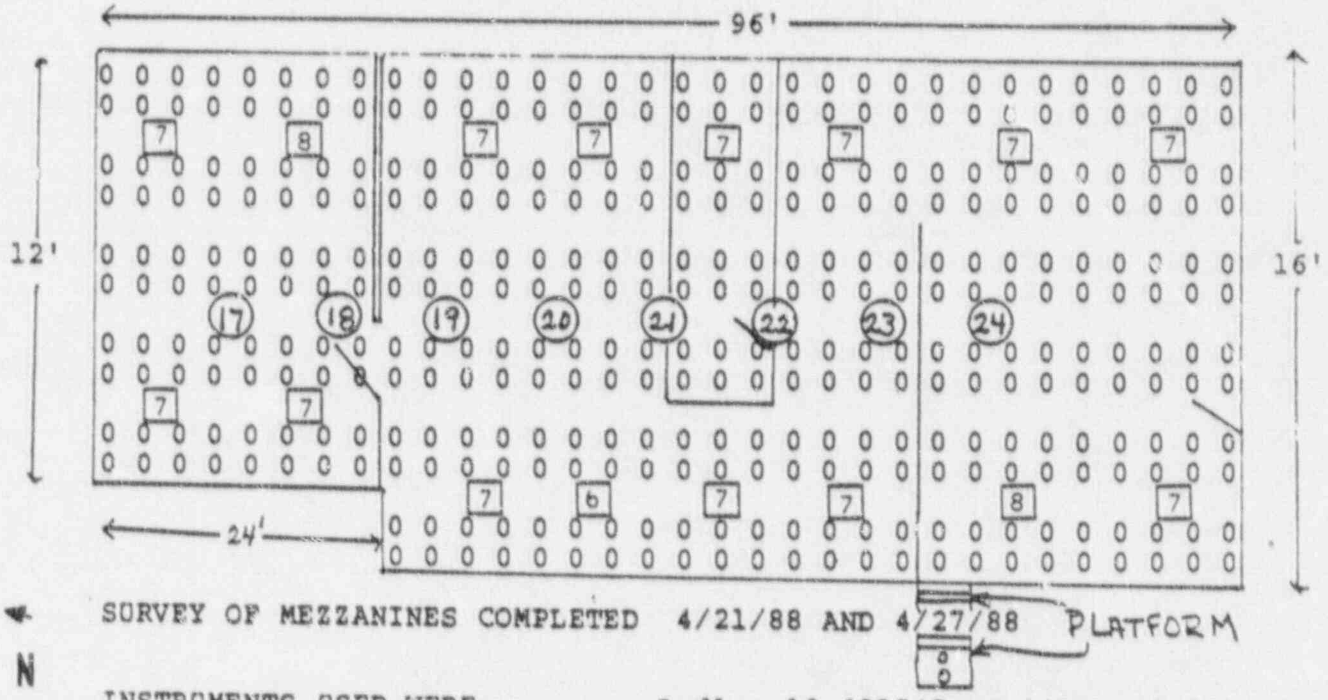
SURVEY OF LABS COMPLETED 4/20/88 AND 4/27/88

INSTRUMENTS USED WERE: Ludlum 19 #33545, Calibrated 2-16-88
Ludlum 12 #46465, Calibrated 11-10-87
TBM-28 #92238, Calibrated 11-9-87

1. Levels were measured on tile floor after cleaning.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm sq in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm sq.
5. Circled numbers are wipe locations.
6. Numbers in squares are measured microR/hr values at 1 meter.
7. No contamination was found on floor or walls.

ATTACHMENT 11:

FINAL SURVEY OF COMBINED MEZZANINES ABOVE LABS 335/ 337/ 339/ 341/ 343/ 345/ 347/ AND 349



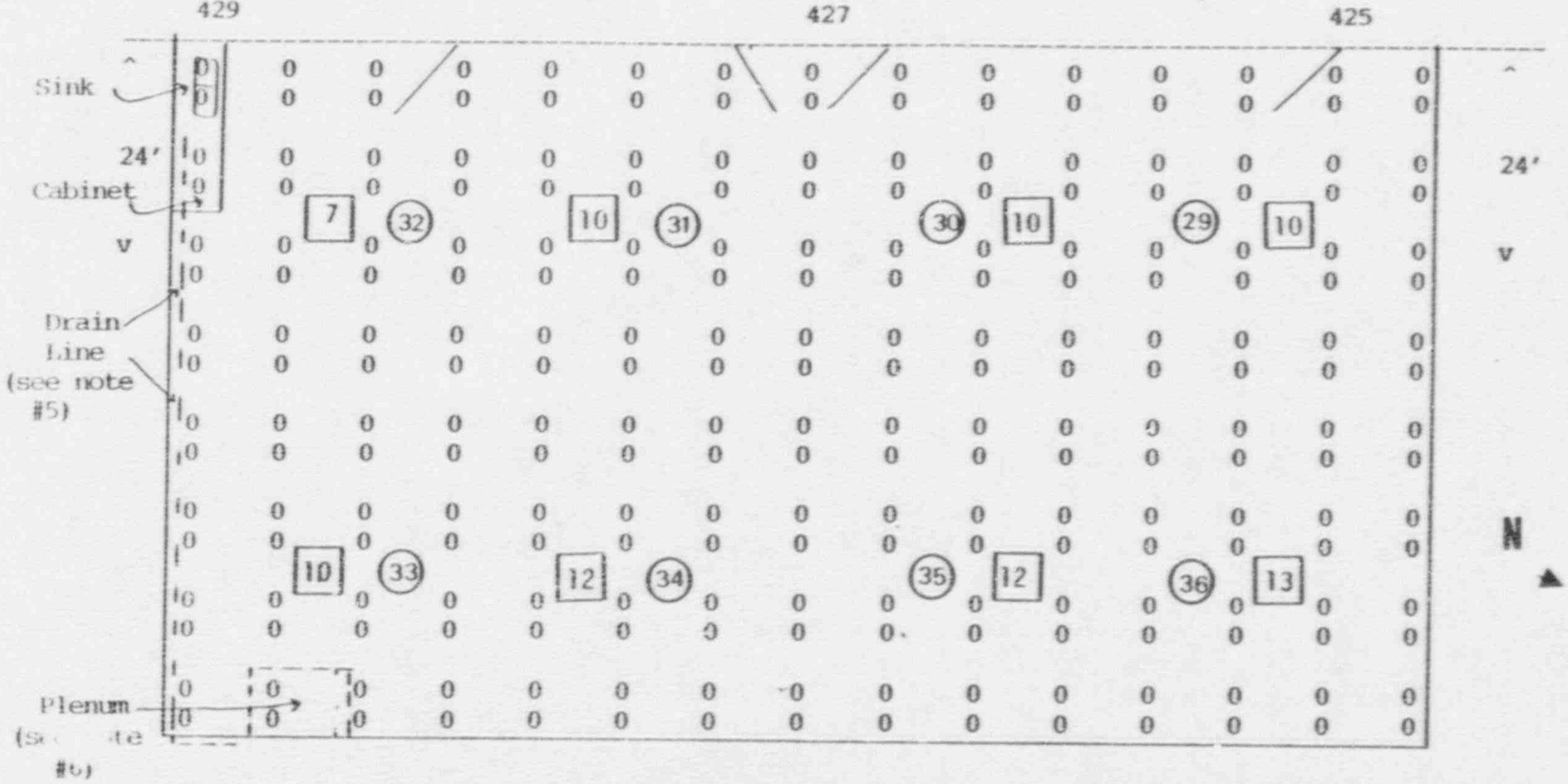
SURVEY OF MEZZANINES COMPLETED 4/21/88 AND 4/27/88

INSTRUMENTS USED WERE:

Ludlum 19 #33545, Calibrated 2-16-88
Ludlum 12 #46465, Calibrated 11-10-87
TBM-28 #92238, Calibrated 11-9-87

1. Levels were measured on tile floor after cleaning.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm square in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm sq.
5. Circled numbers are wipe locations.
6. Numbers in squares are measured micro R/hr values at 1 meter.
7. No contamination requiring cleaning was detected.

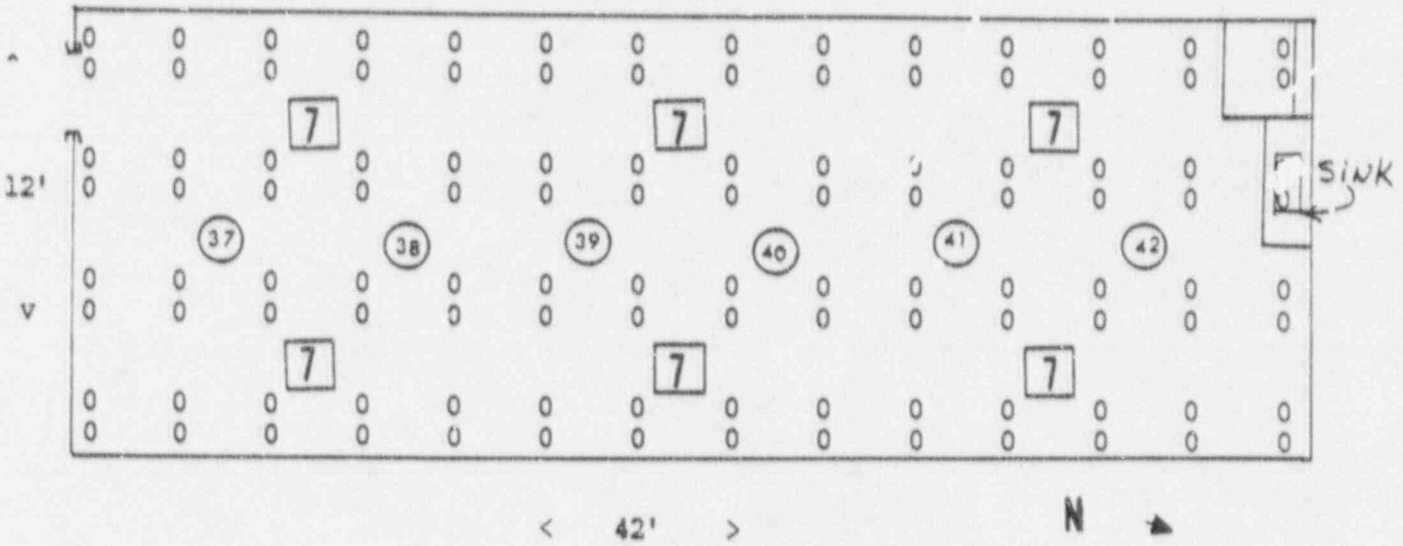
ATTACHMENT 12: FINAL JRVEY OF COMBINED LABS 425/427/4.
THE TOP OF GRID IS 39 1/2' WIDE ; THE BOTTOM OF GRID IS 43 1/2'



FINAL SURVEYS OF LABS 425, 427 AND 429 COMPLETED 8/26/88 AND 8/29/88 USING GM COUNTER (TBM-28 #2759) CALIBRATED 6/24/88 AND LUDLUM #19-33545, CALIBRATED 2/16/88.

NOTES:
1. LEVELS WERE MEASURED ON TILE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. A DRAIN LINE FROM A FORMER HOT SINK HAD BEEN CAPPED ON BOTH ENDS AT SOME TIME IN THE PAST. THE INTERIOR OF THE PIPE MEASURED 10,000 CPM WHEN OPENED. IT WAS REMOVED AND DISPOSED OF AS RADIOACTIVE WASTE ON 8/23/88.
6. THE DOOR GASKETS ON THE FILTER PLENUM MEASURED 500 CPM. THE PLENUM WAS REMOVED AND THE GASKETS WERE DISPOSED OF AS RADIOACTIVE WASTE ON 8/29/88.
7. CIRCLED NUMBERS ARE WIPE LOCATIONS.
8. NUMBERS IN SQUARES ARE MICRO R/HOUR READINGS.

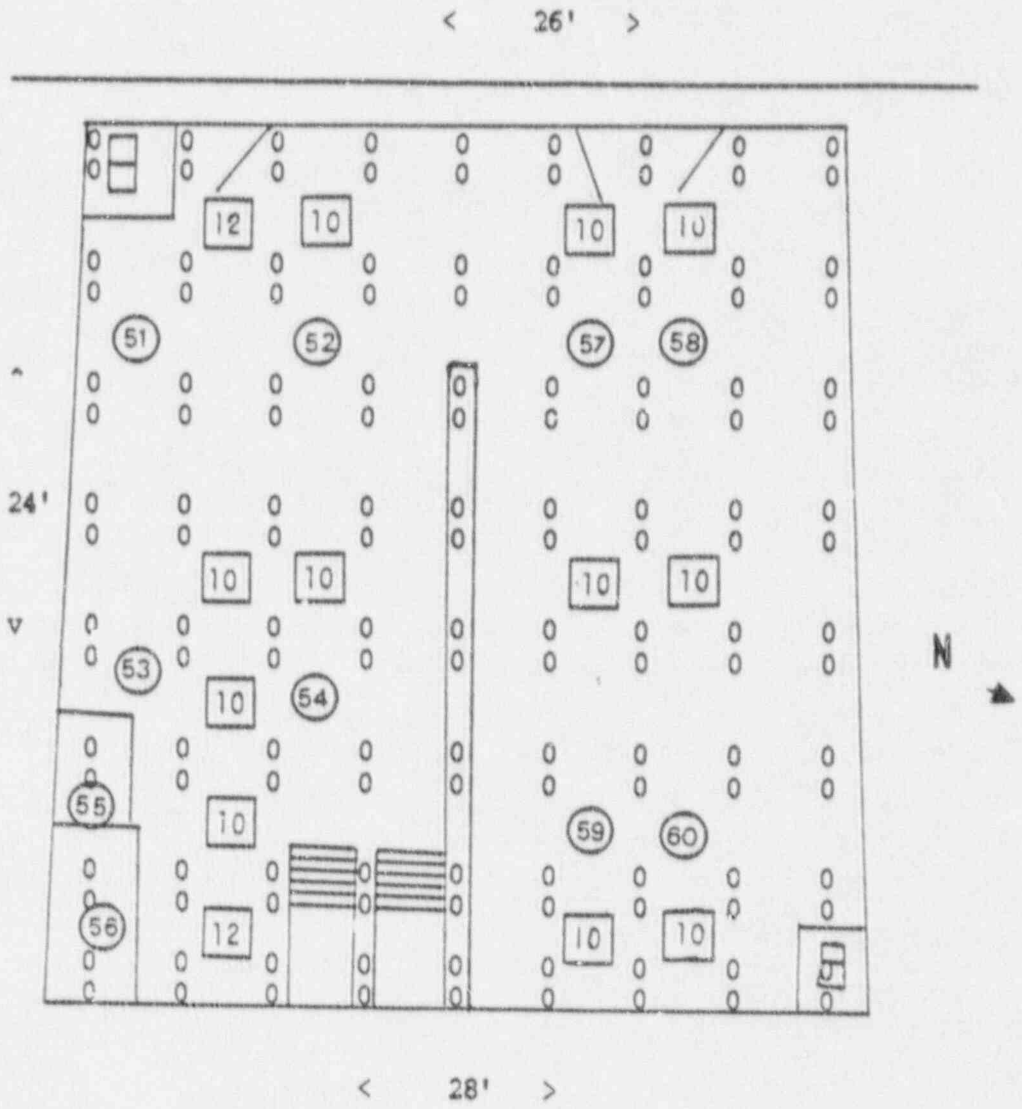
ATTACHMENT 13: FINAL SURVEY OF COMBINED <u>MEZZANINES</u> ABOVE LABS 425, 427, AND 429



FINAL SURVEY OF LAB MEZZANINE WAS COMPLETED 10-20-88, USING GM COUNTER (TBM-28 #2759) CALIBRATED 10/17/88 AND LUDLUM 19 #39764, CALIBRATED 7/7/88.

NOTES: 1. LEVELS WERE MEASURED ON TILE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM SQUARE IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM SQUARE.
5. NUMBERS WITHIN SQUARES ARE LUDLUM 19 READINGS IN MICRO R/HR.
6. NUMBERS IN CIRCLES ARE WIPE LOCATIONS.
7. NO CONTAMINATION WAS DETECTED.

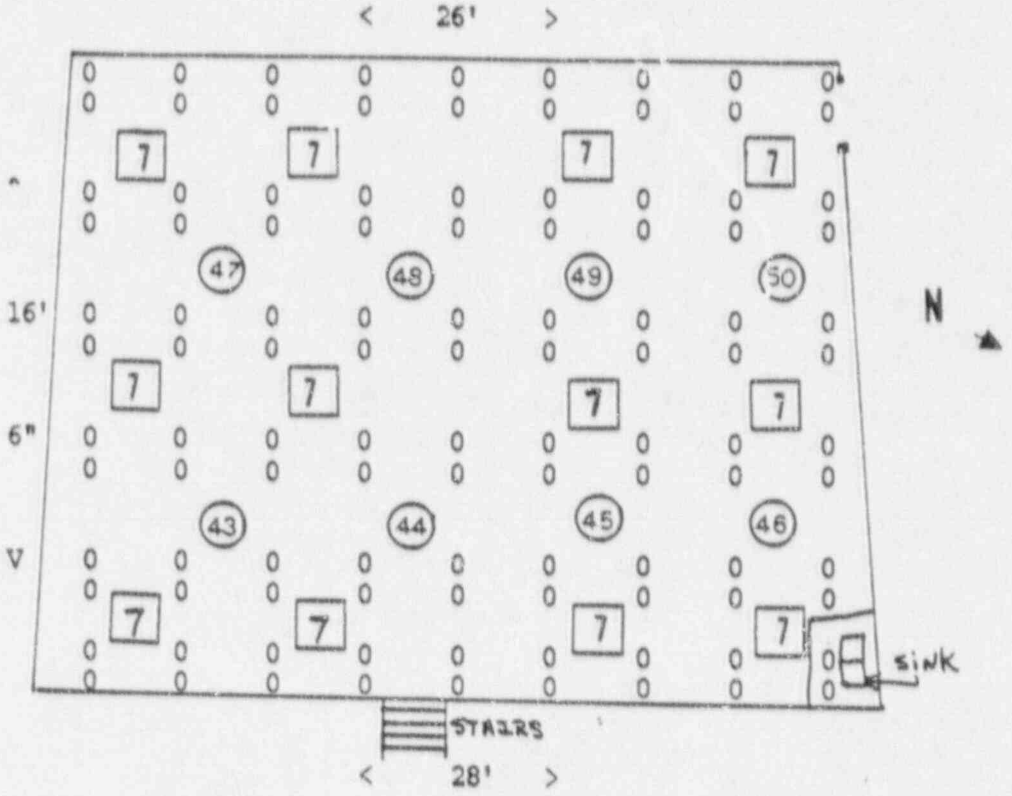
ATTACHMENT 14: FINAL SURVEY OF COMBINED LABS 431 AND 433



FINAL SURVEY OF LABS COMPLETED 10/19/88 AND 10/21/88, USING GM COUNTER (TBM-28 2759), CALIBRATED 10/17/88 AND LUDLUM-19 #39764, CALIBRATED 7/7/88.

NOTES:
1. LEVELS WERE MEASURED ON TILE FLOOR OR FUME HOOD AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM SQUARE IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM SQUARE.
5. NUMBERS IN SQUARES ARE LUDLUM 19 READINGS IN MICRO R/HOUR.
6. NUMBERS IN CIRCLES ARE WIPE LOCATIONS.
7. NO CONTAMINATION WAS DETECTED ON THE FLOORS OR WALLS OF THESE LABS.

ATTACHMENT 15: FINAL SURVEY OF COMBINED MEZZANINE ABOVE LABS 431/433

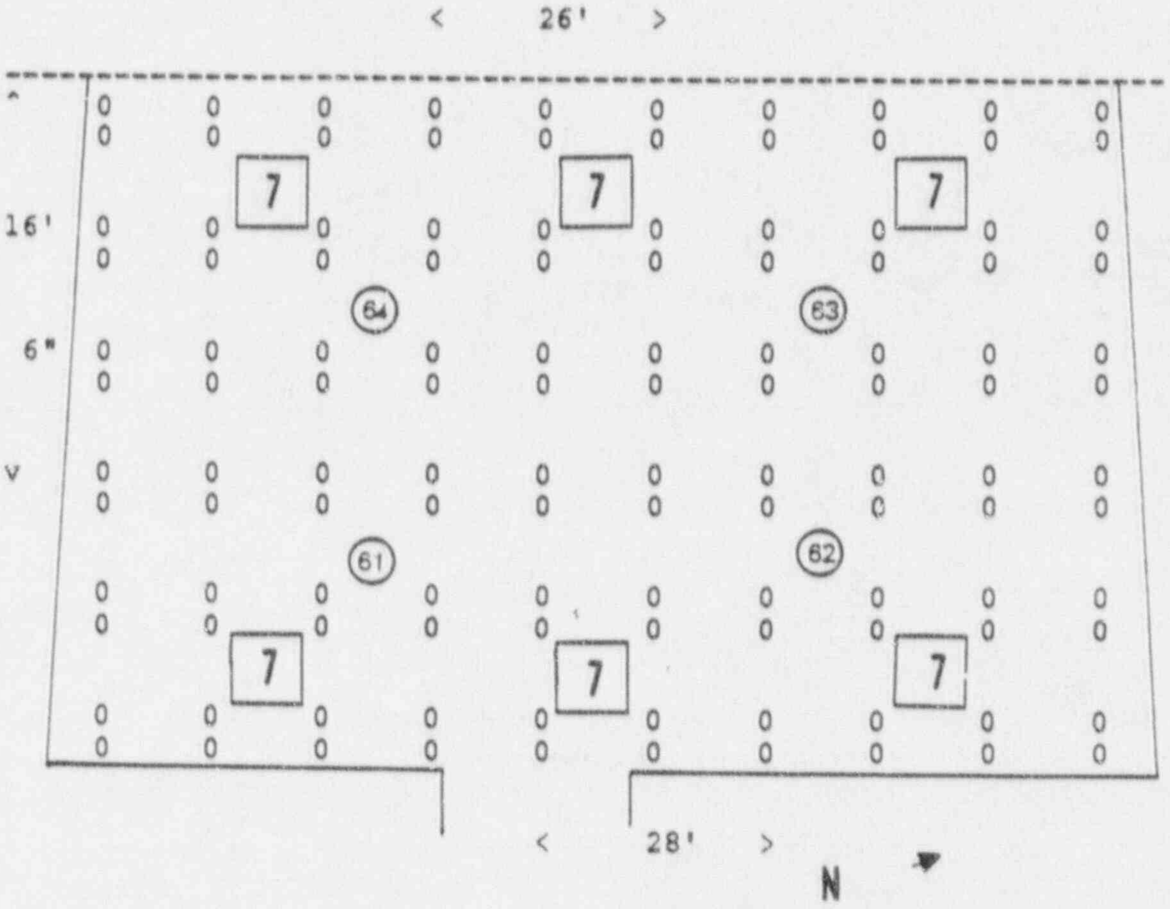


FINAL SURVEY WAS COMPLETED 10-20-88, USING GM COUNTER (TBM-28 #2759) CALIBRATED 10-17-88, PAC1SA #34092 CALIBRATED 8-19-88 AND LUDLUM 19 #39764 CALIBRATED 7-7-88.

NOTES:
1. LEVELS WERE MEASURED ON TILE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM SQUARE IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM SQUARE.
5. NUMBERS IN SQUARES ARE LUDLUM 19 READINGS IN MICRO R/HOUR.
6. NUMBERS IN CIRCLES ARE WIPE LOCATIONS.
7. NO CONTAMINATION WAS DETECTED.

ATTACHMENT 16:

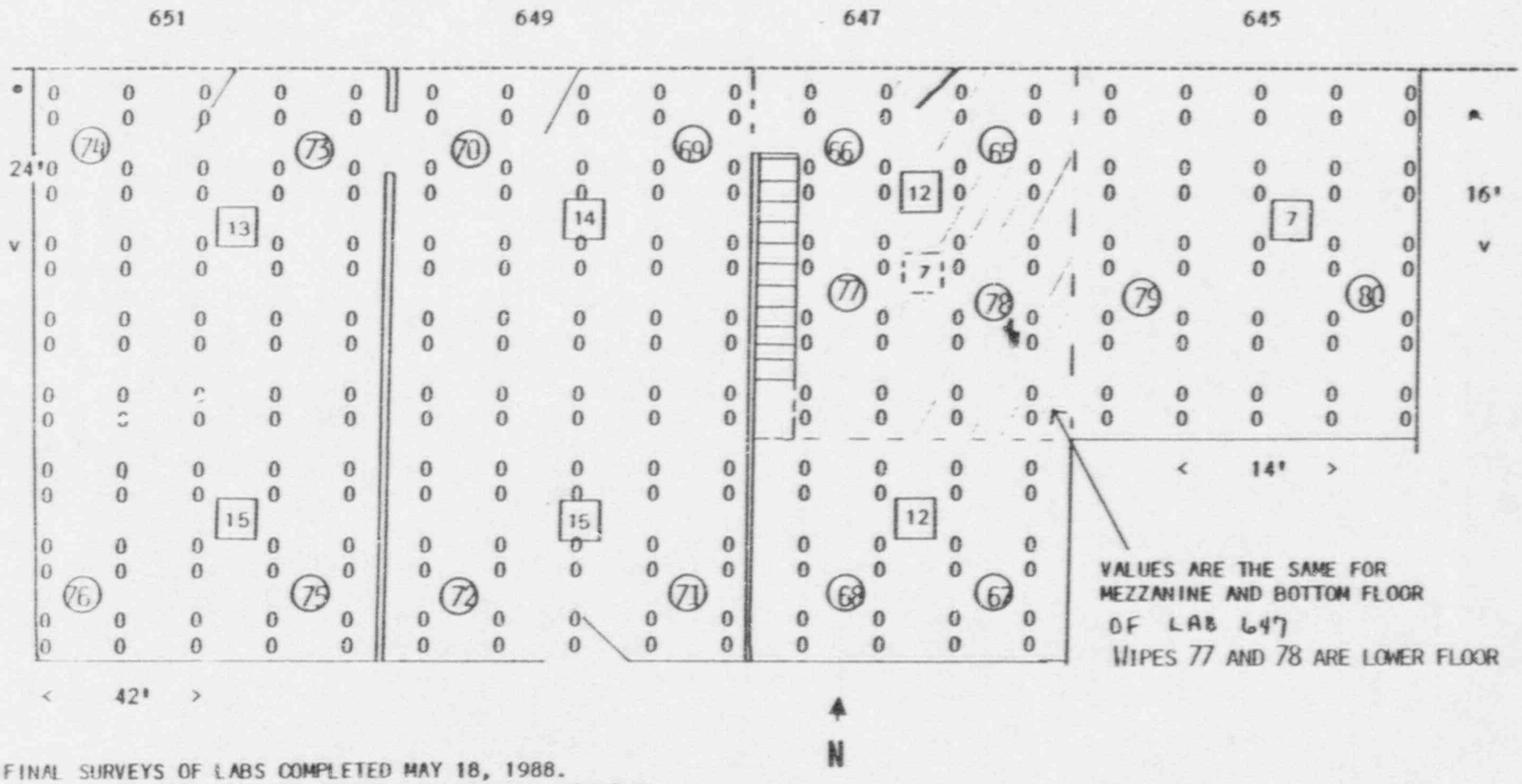
FINAL SURVEY OF <u>MEZZANINE</u> ABOVE LABS 615/617



FINAL SURVEY COMPLETED 5/18/88 USING GM COUNTER (TBM-28 #92238) CALIBRATED 4/21/88 AND LUDLUM 19 #33545, CALIBRATED 2/16/88.

NOTES:
1. LEVELS WERE MEASURED ON TILE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2
   IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. CIRCLED NUMBERS ARE WIPE LOCATIONS.
6. NUMBERS IN SQUARES ARE MICRO R/HOUR READINGS AT 1 METER.
7. NO CONTAMINATION WAS DETECTED.

ATTACHMENT 17: FINAL SURVEYS OF <u>LABS</u> 647,649,651 AND <u>MEZZANINES</u> ABOVE LABS 645/647



VALUES ARE THE SAME FOR MEZZANINE AND BOTTOM FLOOR
OF LAB 647
WIPES 77 AND 78 ARE LOWER FLOOR

FINAL SURVEYS OF LABS COMPLETED MAY 18, 1988.
USING GM COUNTER (TBM-28 #92238) CALIBRATED 4/21/88
AND LUDLUM #19-33545, CALIBRATED 2/16/88.

NOTES:
1. LEVELS WERE MEASURED ON TILE FLOOR AFTER CLEANING.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2.
5. CIRCLED NUMBERS ARE WIPE LOCATIONS.
6. NUMBERS IN SQUARES ARE LUDLUM 19 READINGS IN MICRO R/HOUR.
7. NO CONTAMINATION WAS FOUND.

ATTACHMENT 18: CONTAMINATION SURVEY RESULTS Page 1 of 6

JUN 20 1988

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
L-3 W-1 L-6-323	1.	<1.212E-02	95.00	<2.105E-01	95.00
2 6/17/88 Lab-323	1.	<1.212E-02	95.00	<3.785E-02	95.00
3 Lab-323	1.	9.217E-01	121.25	<2.105E-01	95.00
4 Lab-321	1.	<1.212E-02	95.00	<7.571E-01	95.00
5 Lab 321	1.	<1.212E-02	95.00	<2.105E-01	95.00
6 Lab 323	1.	<1.212E-02	95.00	<7.571E-01	95.00
7 Lab 321 Mezzanine	1.	<1.212E-02	95.00	<1.252E 00	95.00
8 Lab 323 Mezzanine	1.	<1.212E-02	95.00	<3.785E-02	95.00
9 Lab 325 Mezzanine	1.	2.633E-01	245.03	<2.105E-01	95.00
10 Lab 327 Mezzanine	1.	<1.212E-02	95.00	<3.785E-02	95.0
11 Lab 343	1.	<1.212E-02	95.0	<2.105E-01	95.
12 Lab 343	1.	<1.212E-02	95.00	<2.105E-01	95.00
13 Lab 345	1.	<1.212E-02	95.00	<3.785E-02	95.00
14 Lab 345	1.	<1.212E-02	95.00	<2.105E-01	95.00
15 Lab 347	1.	2.633E-01	245.03	<3.785E-02	95.00
16 Lab 347	1.	<1.212E-02	95.00	<3.785E-02	95.00
17 Lab 335 Mezzanine	1.	<1.212E-02	95.00	<2.105E-01	95.00
18 Lab 337 Mezzanine	1.	<1.212E-02	95.00	<2.105E-01	95.00
19 Lab 339 Mezzanine	1.	<1.212E-02	95.00	<2.105E-01	95.00
20 Lab 341 Mezzanine	1.	<1.212E-02	95.00	<7.571E-01	95.00
21 Lab 343 Mezzanine	1.	<1.212E-02	95.00	<3.785E-02	95.00
22 Lab 345 Mezzanine	1.	2.633E-01	245.03	<3.785E-02	95.00
23 Lab 347 Mezzanine	1.	<1.212E-02	95.00	<7.571E-01	95.00

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTI

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

		ALPHA		BETA	
SAMPLE ID	COUNT LENGTH MIN	DPM/100 SQ.CM.	% ERROR 95% CL	DPM/100 SQ.CM.	% ERROR 95% CL
24 Lab 349 Mezzanine	1.	<1.212E-02	95.00	<3.785E-02	95.00
AVERAGE		8.142E-02		2.803E-01	
HIGH		9.217E-01		1.252E 00	
LOW		1.212E-02		3.785E-02	

NOTE! THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

ATTACHMENT 18: CONTAMINATION SURVEY RESULTS Page 3 of 6

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

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SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
LAB3 W-25 Lab 234	1.	<1.014E-02	95.00	<9.520E-01	95.00
26 11/4/88 Lab 234	1.	<1.014E-02	95.00	<4.054E-01	95.00
27 Lab 234	1.	<1.014E-02	95.00	<9.520E-01	95.00
28 Lab 234	1.	<1.014E-02	95.00	<4.054E-01	95.00
29 Lab 425	1.	<1.014E-02	95.00	8.455E-01	150.81
30 Lab 427	1.	2.831E-01	227.93	<3.167E-02	95.00
31 Lab 427	1.	<1.014E-02	95.00	<9.520E-01	95.00
32 Lab 429	1.	<1.014E-02	95.00	<9.520E-01	95.00
33 Lab 429	1.	<1.014E-02	95.00	8.455E-01	150.81
34 Lab 427	1.	2.831E-01	227.93	1.140E 00	125.
35 Lab 427	1.	<1.014E-02	95.00	<1.447E 00	95.0
36 Lab 425	1.	2.831E-01	227.93	<4.054E-01	95.00
37 Lab 429 Mezzanine	1.	2.831E-01	227.93	<4.054E-01	95.00
38 Lab 429 Mezzanine	1.	2.831E-01	227.93	<9.520E-01	95.00
39 Lab 427 Mezzanine	1.	<1.014E-02	95.00	8.455E-01	150.81
40 Lab 427 Mezzanine	1.	<1.014E-02	95.00	<4.054E-01	95.00
41 Lab 425 Mezzanine	1.	<1.014E-02	95.00	<9.520E-01	95.00
42 Lab 425 Mezzanine	1.	<1.014E-02	95.00	<4.054E-01	95.00
43 Lab 433 Mezzanine	1.	<1.014E-02	95.00	<3.167E-02	95.00
44 Lab 433 Mezzanine	1.	6.123E-01	149.03	<9.520E-01	95.00
45 Lab 431 Mezzanine	1.	<1.014E-02	95.00	<3.167E-02	95.00
46 Lab 431 Mezzanine	1.	<1.014E-02	95.00	<9.520E-01	95.00
47 Lab 433 Mezzanine	1.	<1.014E-02	95.00	<3.167E-02	95.00

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
48 Lab 433 Mezzanine	1.	<1.014E-02	95.00	<3.167E-02	95.00
49 Lab 431 Mezzanine	1.	<1.014E-02	95.00	<4.054E-01	95.00
50 Lab 431 Mezzanine	1.	<1.014E-02	95.00	<3.167E-02	95.00
51 Lab 433	1.	<1.014E-02	95.00	<3.167E-02	95.00
52 Lab 433	1.	<1.014E-02	95.00	<3.167E-02	95.00
53 Lab 433	1.	6.123E-01	149.03	<3.167E-02	95.00
54 Lab 433	1.	<1.014E-02	95.00	<9.520E-01	95.00
55 Lab 433	1.	<1.014E-02	95.00	<4.054E-01	95.00
56 Lab 433	1.	2.831E-01	227.93	<9.520E-01	95.00
57 Lab 431	1.	2.831E-01	227.93	<4.054E-01	95.00
58 Lab 431	1.	<1.014E-02	95.00	<9.520E-01	95.00
59 Lab 431	1.	<1.014E-02	95.00	<4.054E-01	95.00
60 Lab 431	1.	6.123E-01	149.03	<4.054E-01	95.00
61 Lab 615 Mezzanine	1.	<1.014E-02	95.00	<3.167E-02	95.00
62 Lab 617 Mezzanine	1.	2.831E-01	227.93	<4.054E-01	95.00
63 Lab 615 Mezzanine	1.	<1.014E-02	95.00	8.455E-01	150.01
64 Lab 617 Mezzanine	1.	<1.014E-02	95.00	<4.054E-01	95.00
65 Lab 647	1.	2.831E-01	227.93	<4.054E-01	95.00
66 Lab 647	1.	<1.014E-02	95.00	<4.054E-01	95.00
67 Lab 647	1.	<1.014E-02	95.00	<4.054E-01	95.00
68 Lab 647	1.	<1.014E-02	95.00	<9.520E-01	95.00
69 Lab 649	1.	2.831E-01	227.93	[illegible]	[illegible]
70 Lab 649	1.	2.831E-01	227.93	<9.520E-01	95.00

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES

ATTACHMENT 15. CONTAMINATION SURVEY RESULTS

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
71 Lab 649	1.	<1.014E-02	95.00	<4.054E-01	95.00
72 Lab 649	1.	2.017E-01	228.93	3.772E 00	60.93
73 Lab 651	1.	<1.014E-02	95.00	<4.054E-01	95.00
74 Lab 651	1.	2.831E-01	227.93	8.152E-01	156.58
75 Lab 651	1.	2.831E-01	227.93	<1.447E 00	95.00
76 Lab 651	1.	2.831E-01	227.93	<3.167E-02	95.00
77 Lab 647 Mezzanine	1.	<1.014E-02	95.00	<3.167E-02	95.00
78 Lab 647 Mezzanine	1.	6.123E-01	149.03	<4.054E-01	95.00
79 Lab 645 Mezzanine	1.	<1.014E-02	95.00	<1.447E 00	95.00
80 Lab 645 Mezzanine	1.	<1.014E-02	95.00	<9.520E-01	95.00
AVERAGE		1.262E-01		6.371E-01	
HIGH		6.123E-01		3.772E 00	
LOW		1.014E-02		3.167E-02	

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

NOV 1 5 1988

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

		ALPHA		BETA	
SAMPLE	COUNT TIME (MIN)	DPM/100 CM SQ	% ERROR 95% CL	DPM/100 CM SQ	% ERROR 95% CL
[illegible] Lab 327	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Lab 327	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Lab 327	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Lab 327	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE		[illegible]		[illegible]	
MIN		[illegible]		[illegible]	
MAX		[illegible]		[illegible]	

*** % ERROR DOES NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES ***

GENERAL ATOMICS

January 30, 1989
696-1337

Mr. Robert D. Thomas, Chief
Nuclear Materials Safety Section
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Subject: Docket 70-734: SNM-696; Request for Confirmatory Survey (Experimental Building - Stage 1)

Reference: K. E. Asmussen letter to Robert D. Thomas, "Request for Release of Selected Laborat s to Unrestricted Use (Group 3)," dated December , 1988

Dear Mr. Thomas:

As you are aware, General Atomics (GA) has been involved in the process of decontaminating and obtaining the release to unrestricted use of certain portions of its facilities. Most recently, GA completed the decontamination and final surveys of an additional portion of its Experimental Building (Building 9) where certain TRIGA fuel fabrication operations had been conducted until about 1975. This area is located in the northwest corner of Building 9 and prior to 1975 was referred to as the "Hot Suite" area. Note, however, that not all rooms referred to as being a part of the "Hot Suite" area were involved with the use of radioactive material.

The portion of Building 9 referred to as the "Hot Suite" area is occupied by GA's telecommunications group. Since it is not feasible to move all of the telecommunication equipment and personnel from the entire area at one time. GA is surveying and pursuing the release of the area in three (3) stages.

Decontamination of the first stage, i.e., "Stage 1," area has been completed and the results of GA's final radiation and contamination surveys are documented in the enclosed report. The only observed containment was uranium, with the U^{235} enrichment ranging from about three (3) to about ten (10) percent. This report is being provided to assist you in planning for a confirmatory survey and in support of the subsequent release of the subject facilities to unrestricted use.

GA has decontaminated equipment and facilities consistent with the State of California's and U.S. Nuclear Regulatory Commission's guidelines for release of facilities and equipment to unrestricted use. The results of GA's final surveys (provided in the enclosed report) demonstrate compliance with these guidelines.

IE07

Last December, GA submitted a similar report and requested a confirmatory survey be performed on a group of several laboratories referred to as "Group 3" in GA's Building 2 (referenced above). It was recognized at the time that scheduling the confirmatory survey of the "Group 3" laboratories should be coordinated with the survey of the recently decontaminated portion of Building 9. Now that GA has submitted the requisite final survey reports, we look forward to the confirmatory surveys being scheduled as soon as possible.

While the activities and the materials used (i.e., enriched uranium) in the "Hot Suite" area of Building 9 were licensed by the NRC, we are submitting the enclosed report to the State of California Department of Health Services and requesting their release of the subject area.

GA has tenants who are anxious to occupy the subject laboratories and associated offices as soon as they are released. And, GA has temporarily displaced telecommunications personnel and equipment until such time as the "Hot Suite" areas are released. Therefore, it is very important to GA to have the confirmatory surveys conducted expeditiously.

If you should have any questions regarding our request or the enclosed report, please contact me at (619) 455-2823.

Very truly yours,

Keith E. Asmussen

Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

KEA/mk
Enclosure

DECONTAMINATION OF THE "HOT SUITE" AREA OF THE TRIGA FUEL FABRICATION FACILITY FORMERLY LOCATED IN BUILDING 9 FOR RELEASE TO UNRESTRICTED USE

STAGE 1

JANUARY 27, 1989

TABLE OF CONTENTS

LIST OF ATTACHMENTS

INTRODUCTION

Until April 1975, TRIGA Fuel Fabrication activities licensed by the USNRC were conducted in two locations in General Atomics' Experimental Building (Building 9). One location was in the east side of the former "Pilot Plant" (high bay) area of the building and the other location was in the northwest corner of the building. This area in the northwest corner was then known as the "Hot Suite" area (See Attachment 2). TRIGA Fuel Fabrication activities were transferred in April 1975 to a new facility at GA (i.e. Building 22).

Decontamination of the "Hot Suite" area began in April and continued until around July 1975. The area was decontaminated for nonradioactive use but was not "officially" released by NRC to unrestricted use. Radioactive material was still being used in other areas of the building.

General Atomics (GA) has no plans for conducting future activities involving the use of radioactive materials in the Experimental Building. Accordingly, over the last two years, GA has been involved in the process of decontaminating and obtaining the release to unrestricted use of the Experimental Building (Building 9).

Beginning in October 1986, GA decontaminated the Experimental Building; except for the "Hot Suite" area. GA submitted a report dated July 28, 1987 to the NRC and to the State of California (Reference 1) requesting the release of this building to unrestricted use. This report included the former "Pilot Plant" area where a portion of TRIGA Fuel Fabrication activities were conducted but did not include the "Hot Suite" area which was occupied by GA's telecommunication group at that time.

After confirmatory surveys were completed and the building was found to meet the release criteria, the State of California released the building to unrestricted use (Amendment #87 of GA's Radioactive

Materials License #C145-80, Reference 2). The NRC also released the building to unrestricted use on October 1, 1988 (Reference 3) after completion of confirmatory surveys, with the exception of the small area where TRIGA Fuel Fabrication activities had been located herein called the "Hot Suite" area. Please note: not all portions of the area referred to here as the "Hot Suite" area involved the use of radioactive materials.

As mentioned above, GA has no plans for conducting any future activities involving radioactive materials in the "Hot Suite" area of the Experimental Building and would like to release the area to unrestricted use. However, since it was not feasible to move the telecommunications equipment and activities all at the same time, GA is surveying and pursuing the release of the "Hot Suite" area in three (3) stages.

The total area of the "Hot Suite" area is conservatively estimated at 4036 ft^2. Stage 1 (2880 ft^2) includes Rooms 39, 48, 49A, 50, 47A, a hallway area east and south of room 47A and the rooms which previously housed the former "Clean Machine Shop" area (these are: most of Room 38, a hallway area east of room 38, and rooms 34 and 35). Stage 2 (587 ft^2) includes rooms 40, 41, 42, 43 and 47. Stage 3 is room 49 (569 ft^2).

In late 1988 and January 1989, GA surveyed and decontaminated Stage 1 (2880 ft^2) of the "Hot Suite" area for release to unrestricted use. This report summarizes the surveys completed for Stage 1.

All the equipment (primarily telecommunications equipment) from the Stage 1 area was transferred to a temporary location. The carpet installed over the original concrete floor was removed in most areas and the concrete below it was surveyed for contamination. Some areas of the concrete floor were found to be slightly contaminated and two floor drains were also found to have some slight contamination. The only observed contaminant was uranium; U-235 enrichment varied from about three (3) percent to about ten (10) percent. The concrete was decontaminated by scraping/scabbling the surface. About 256 ft^2 of the 2880 ft^2 floor area required decontamination; which represents about 9% of the Stage 1 area. Three localized areas of the wall in room 49A (a total of about 5 ft^2) were also decontaminated.

In the process of removing the drain line, concrete was removed in localized areas to the point of exposing the underlying soil. The results of the analyses of the soil samples collected in these areas showed only natural background radionuclide concentrations.

GA has decontaminated the Stage 1 areas consistent with the State of California's and U. S. Nuclear Regulatory Commission's guidelines for Release of Facilities and Equipment to Unrestricted Use. The results of the final radiation and contamination surveys as well as the soil sample results are included in this report to demonstrate compliance with the guidelines.

SITE DESCRIPTION

The location of the Experimental Building (Building 9) with respect to other facilities on the GA Site is shown in Attachment 1. A layout of the Building showing the "Hot Suite" area is shown in Attachment 2. The entire building, including second floors and mezzanines is almost 59,648 ft^2. Of this area, the former "Hot Suite" occupies less than 4036 ft^2.

Attachment 3 shows the current status of the rooms which now occupy the former "Hot Suite" area. Attachment 4A shows the "Hot Suite" area as it existed when TRIGA Fuel Fabrication activities were conducted there. Attachment 4 is a view graph of this drawing which can be overlaid on the drawing showing the current status (Attachment 3). A comparison of the two drawings reveals that some of the original walls of the "Hot Suite" area were removed during the reconstruction of the area and new walls were installed. Because of these differences, the area (ft^2) is conservatively estimated to ensure that all previous "Hot Suite" areas are included in the final release surveys.

The former "Hot Suite" area contained a "Hydride Room" (currently Rooms 39 and 50), a "Hot Machine" shop (currently Rooms 49A, 49, 40, 47 and portions of 47A, 41, 42 and 43), a "Hot Furnace" or "Melt Room" (currently Room 48), a "Change Room" (currently a portion of room 47A and a portion of the hallway east and south of room 47A) and a "Clean Machine Shop" (most of room 38, a portion of the hallway east of room 38, and rooms 34 and 35).

The total area of the "Hot Suite" (4036 ft^2) is being released in three stages. Attachment 5 shows the various rooms involved in each of the three (3) decontamination stages.

Stage 1 (2880 ft^2) includes Rooms 39, 48, 49A, 50, 47A, a hallway east and south of room 47A, and the rooms which previously housed the "Clean Machine shop" (most of room 38, the hallway east of room 38 and rooms 34 and 35). Stage 2 (587 ft^2) includes rooms 40, 41, 42, 43 and 47. Stage 3 is room 49 (569 ft^2).

The approximate area in ft^2 for each room to be released to unrestricted use is provided below as well as the stage it is in.

Room	Approximate area (ft^2)
Stage 1	
Room 39	246
Room 48	528
Room 49A	456
Room 50	174
Room 47A	137
Hallway (east and south of room 47A)	330
Former "Clean Machine Shop" Area	
Room 38	182
Room 34	286
Room 35	370
Hallway area east of room 38	171
Total Stage 1	2880

Stage 2	
Room 40	106
Room 41	81
Room 42	94
Room 43	94
Room 47	212
Total Stage 2	587
Stage 3	
Room 49	569
Total Stage 3	569
TOTAL (All Stages)	4036

The surveys in this report are limited to the rooms identified as Stage 1.

HISTORICAL OVERVIEW OF PROCESSING ACTIVITIES

The Hot Suite's existence began in 1958 primarily for the research, development, and manufacturing of TRIGA fuel elements in accordance with NRC (previously AEC) licenses SNM-69 and SNM-696. This work involved primarily the use of 20% enriched uranium (U-235). A review of past Work Authorizations revealed that it was also used for small test runs of prototype and non-TRIGA reactor fuel using mostly depleted uranium. In addition, a large batch of fuel was fabricated for the Massachusetts Institute of Technology using "normal" uranium.

A new TRIGA Fuel Fabrication Facility was constructed at General Atomics, and in April 1975, transfer of usable equipment from the "Hot Suite" to the new building began. In May 1975, contaminated components were removed from the Hot Suite and disposed of as contaminated waste and facility decontamination efforts began. The building was decontaminated to very low levels; less than 500 counts per minute alpha fixed contamination (measurements were made on a grid with a portable alpha counter) and less than 20 dpm/100 cm^2 removable contamination (Reference 5).

TARGET CRITERIA FOR UNRESTRICTED RELEASE

The following approved target criteria have been taken from Reference 4. Table 1 (Attachments 6A and 6B) is taken from USNRC's and State of California's (respectively) criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into our SNM-696 and State of California licenses. The limits in this table were used for releasing concrete and other surfaces at the facility to unrestricted use.

RADIATION DETECTION EQUIPMENT

The following radiation detection equipment was used for the various surveys and analysis of soil samples.

1. Beta/gamma counters
   a. Model TBM 28 geiger counters manufactured by Technical Associates were used to survey surfaces for beta/gamma contamination. The instruments contain a pancake geiger mueller (GM) detector which has a window thickness of less than 7 mg/cm^2. The instrument has three ranges covering from 0-50,000 counts per minute (cpm).
   b. Model 3 ratemeter with a model HP-210 tungsten shielded pancake GM detector manufactured by Ludlum Measurements, Inc. The instrument has three scales covering from 0-400,000 cpm.

2. Alpha counters
   a. Model 12 rate meters with Model 43-44 air proportional alpha probes manufactured by Ludlum Measurements Inc. were used to survey equipment and surfaces for alpha contamination. The instrument has four ranges covering from 0-500,000 counts per minute.
   b. Model 12 rate meters with Model 43-1 scintillation alpha probes manufactured by Ludlum Measurements Inc. were used to survey equipment and surfaces for alpha contamination. The instrument has four ranges covering from 0-500,000 counts per minute.

3. Gamma Detectors

a. Model 19 microR meters (containing a NaI scintillation detector) manufactured Ludlum Measurements Inc. were used to survey the localized areas where soil was reached after the removal of the drain line and for exposure rate measurements on the surface of the concrete and at one meter above the surface.

b. Gamma spectral analysis on selected samples of concrete and soil samples were done using a high purity germanium detector manufactured by Canberra Industries, Inc.

4. Wipe Analysis

Wipe samples collected throughout the facility after clean up operations were counted using two (2) Model 2404 low-level alpha beta gamma counting systems manufactured by Canberra Industries, Inc.

All portable instruments are calibrated semiannually using a nominal 30 curie Cs-137 source except the Ludlum Model 19 which is calibrated by the manufacturer. The alpha/beta systems and the germanium detector systems have been calibrated for the various types of samples. This calibration is checked on a daily or weekly basis depending on usage.

The final survey results have been converted from cpm (counts per minute) for a particular detector to dpm/100cm^2 by correcting the counts per minute observed by appropriate detector readings for background, detector efficiency and geometric factors associated with the instrumentation.

1. Background

A "standard" natural background was determined for each type of detector and subtracted from the survey readings.

2. Efficiency

Portable beta/gamma (GM) and alpha counters were calibrated to determine their efficiencies for uranium after analyses of samples of contaminated concrete from various parts of the building showed uranium contamination (the U-235 enrichment varied from 3-10%).

In order to simulate the conditions on the concrete surfaces, concrete blocks having an area of approximately 25 cm x 25 cm previously spiked with NBS traceable standard liquid solutions of depleted uranium, 20 percent and 93 percent enriched uranium to the average allowable release levels listed in Table 1. The average allowable level for an area one meter by one meter or less is 5000 dpm/100 cm^2 and the maximum allowable level is 15,000 dpm for an area less than 100 cm^2 (Attachments 6A and 6B). Surface measurements of the blocks were obtained with the instruments and percent efficiencies were obtained. Since the blocks were for depleted uranium, 20% and 93% enrichments, an activity correlation was used to estimate the limits for enrichments 3-10%. The readings were corrected for efficiency by multiplying by the appropriate correction factor.

3. Geometry Correction

The values listed in Table 1 (Attachments 6A and 6B) are in dpm/100 cm^2, therefore, a correction factor was applied to the values to correct for the smaller area of the detector. The TBM-28 has a 5 cm diameter detector which measures a 19.6 cm^2 area. The reading is corrected by multiplying by 5.1. The alpha detectors used for the surveys "see", at any given time, an area of about 78.7 cm^2, which then requires a correction factor of 1.27.

INITIAL SURVEY AND DECONTAMINATION EFFORTS

INITIAL SURVEY

An initial survey was conducted in the area to determine if there was any remaining contamination. Radiation measurements using a microR meter showed only natural background levels. A beta/gamma contamination survey on the surface of the carpeted floors and exposed concrete areas was conducted (measurements were made with Model TBM-28 geiger counters). Low (beta/gamma) levels were detected (~350 counts per minute (cpm) on some portions of the floor in room 49A. Portions of the the roll-up door (in room 48) had the highest level of contamination detected (up to 10,000 cpm beta-gamma).

DECONTAMINATION EFFORTS

All the equipment (primarily telecommunications equipment) from the Stage 1 area was transferred to a temporary location. The carpet installed over the original concrete floor was removed in most of the rooms (i.e. those rooms where there had been potential for contamination) and the concrete below it was surveyed for contamination.

Some areas of the concrete floor were found to be slightly contaminated and two floor drains in rooms 49A and 50 were also found to have some contamination. Samples of contaminated concrete from the floor areas were collected and gamma scanned.

The only observed contaminant was uranium (with U-235 enrichment varying from about 3-10 percent). The concrete was decontaminated by scraping/scabbling the surface and the floor drains and underground piping from the floor drains were removed from rooms 49A and 50.

The Stage 1 "Hot Suite" area has been conservatively estimated to be about 2880 ft^2. About 256 ft^2 of the 2880 ft^2 required decontamination; which represents about 9% of the Stage 1 area.

The floor area decontaminated in each room is provided in the table below:

Room	Approximate Area (ft^2)	Approximate Total Area (ft^2) Decontaminated
Stage 1		
Room 39	246	1
Room 48	528	50
Room 49A	456	200

Room 50	174	4
Room 47A	137	1
Hallways (east and south of room 47A)	330	0
Former "Clean Machine Shop" Area		
Room 38	182	2
Room 34	286	0
Room 35	370	0
Hallway area east of room 38	171	0
Total Stage 1	**2880**	**256**

ROOMS 49A, 50 and 39

The initial survey of rooms 39, 49A and 50 was conducted after the removal of equipment, carpet and carpet glue. The survey is provided in Attachment 7 and a description of cleanup activities is provided below.

ROOM 49A

About 50% of the concrete floor was scabbled after beta gamma levels showed levels ranging from 200 to 2000 cpm. The floor drain and drain pipe were removed after levels showed about 300 cpm on the surface of the drain. About 2000 cpm were detected in the drain pipe. Soil samples were also collected in the exposed soil locations.

All of the original three walls of room 49A (up to two meters) were surveyed after the removal of drywall panels which had been installed over the walls during refurbishment in 1975. The initial and final surveys of the three walls are provided in Attachment 8A (3 pages). The south wall did not exist during "Hot Suite" operations. There were three small locations of contamination measuring about 300, 400 and 500 counts per minute (cpm) beta/gamma and located along the bottom two feet of the wall. These three small spots totaled an area of about 5 ft^2 and were decontaminated to natural background levels. No other locations on the walls were found to be contaminated.

ROOM 50

Two small spots on the floor were scabbled when levels showed about

2500 cpm beta/gamma levels and about four (4) ft^2 of the concrete area in the south end of the room were scabbled when levels of about 500 cpm were detected. The floor drain and the drain pipe were also removed (the drain was reading about 500 cpm). Soil samples were collected in the exposed areas. Two out of three (~66%) of the original walls were surveyed. The north wall was not in existance during "Hot Suite" operations. No contamination was detected on any of the walls. These surveys are provided in Attachment 8C.

Room 39

About a 1 ft^2 area of the concrete surface was scabbled when beta/gamma levels showed about 400 cpm in some isolated spots along the concrete floor. No other contamination was detected. A detailed survey of the walls in this room were not completed since surveys of the walls of room 50 did not reveal any contamination. Both room 39 and room 50 had formerly been the "hydride room".

ROOM 47A and Hallway area east and south of room 47A

The north part of room 47A had been part of the "Hot Machine Shop" during "Hot Suite" operations. This room and the hallway east and south of the room were formerly the "Change Room" and had no record of contamination. The initial (and final) surveys were completed on the concrete surface in room 47A and on the carpeted hallway areas east and south of the room. The only contamination detected in this room were two small localized areas in the north part of room 47A which measured about 300 cpm (beta/gamma) and represented less than a 1 ft^2 area. The concrete in these two spots was scabbled until levels were at normal background levels. It appears that the spots were directly underneath the previous "Hot Machine Shop" wall. No other locations in room 47A were found to be contaminated. The hallway east and south of room 47A was surveyed with the carpeting in place since it was outside the previous "contamination control" boundary (former "Change Room" area) and the portion of room 47A (concrete floor) which was also part of the "Change Room" was surveyed and no contamination was detected.

ROOM 48

The initial floor survey of the floors in room 48 is provided in Attachment 9. Contamination was detected in the cracks along the concrete floor and in three other spots; measurements ranged from about 250 to 2000 cpm (beta/gamma). All of these locations were scabbled. The roll-up door to room 48 (which was located on the south side of the room) measured up to 8000 cpm (beta/gamma). The roll-up door was removed on 8/10/88 and disposed of as radioactive waste. Most of the original walls (up to 2 meters) were also surveyed. These surveys are provided in Attachment 8B. There was no contamination detected on any of the walls.

"Old Machine Shop" Area

This area is now most of room 38, the hallway area east of room 38, and portions of rooms 34 and 35. (See Attachments 3, 4, and 5). The "Clean Machine Shop" area had no record of contamination. A portion of the area (Room 38 containing ~182 ft^2) was selected for a detailed survey. This survey involved removing the equipment and supplies, removing the carpet from the concrete floor and surveying the concrete surface for alpha and beta/gamma contamination. Two small spots of contamination were detected (See Attachment 12). One spot (about 1 ft^2) was located in the southwest corner of the room (on the other side of room 49A) and measured about 10,000 cpm beta/gamma. The other spot (also about 1 ft^2) was located in the west corner of the room (on the other side of room 40) and measured about 6000 cpm beta/gamma. Both spots appear to be the result of a spill(s) in rooms 49A and/or 40 which housed the "Hot Machine Shop" and not as a result of contamination of the "Clean Machine Shop". This portion of room 38 was not part of the "Old Machine Shop" during operations (see Attachments 3 and 4). No other contamination was detected.

A cursory survey of the carpeted floor areas which previously housed the "Clean Machine Shop" was also completed. This included the hallway area east of room 38, and rooms 34 and 35. No contamination was detected.

SOIL SAMPLING

In the process of removing the two floor drains and drain pipes from rooms 49A and 50, concrete was removed in localized areas to the point of exposing the underlying soil. Three soil samples were collected, including a "composite" soil sample. The locations of these soil samples are shown in Attachment 13. The soil samples were analyzed by gamma ray spectroscopy using a high purity germanium detector system in accordance with written procedures. All gamma emitting radionuclides were identified and their concentrations were determined. The results of the analyses of the soil samples collected in these areas (Attachment 15) showed only natural background radionuclide concentrations.

Radiation measurements on the surface of the soil were obtained using a microR meter. The readings were at normal background levels (Attachment 13).

FINAL RADIATION SURVEYS

Table 1 (Attachments 6A and 6B) provide acceptable (approved) limits for fixed contamination levels. Final radiation surveys of the areas which were cleaned and/or scabbled were conducted. The measurements of average contamination (in dpm/100 cm^2) were averaged over 1 M^2 area or less. The maximum contamination level (also in dpm/100 cm^2) applies to an area of not more than 100 cm^2. The final surveys for Stage 1 are provided in this report as follows:

Attachment 8:	Final Survey of Rooms 39, 49A AND 50
Attachment 8A:	Initial and Final Surveys of room 49A walls
Attachment 8B:	Final Survey of room 48 walls
Attachment 8C:	Final Survey of room 50 walls
Attachment 10:	Final Survey of Room 48
Attachment 11:	Final Survey of Room 47A and Hallway
Attachment 12:	Initial and Final Survey of Room 38

A microR meter was also used to survey the rooms and to measure radiation levels. The final surveys show the measurements obtained on the surface and at one meter above the surface. These levels were all within normal background levels. The results of this survey are provided in Attachment 14A.

Alpha counters were also used to survey the rooms. Very low (if any) levels of alpha contamination were detected. The beta/gamma levels were used to determine allowable release levels for the uranium contaminated areas.

FINAL CONTAMINATION SURVEYS

Table 1 (Attachments 6A and 6B) provides limits for acceptable removable surface contamination levels. Wipes were collected on the floors and the walls of the rooms. The wipe sample locations are shown in Attachments 14B for the floor locations and Attachments 8A, 8B, and 8C for the wall locations. The results are provided in Attachment 16 (3 pages). The contamination levels in every location were < 20 dpm/100 cm^2 area, and well below the Table 1 limits (Attachment 6A and 6B) for removable contamination.

COMPLIANCE WITH THE TARGET CRITERIA

Facilities and Equipment

Concrete and other surfaces of the building were cleaned to levels below the limits in Table 1. The final surveys provided in this report demonstrate compliance.

Direct Radiation

The direct radiation levels in all areas of the Stage 1 areas are at or below normal background levels.

CONCLUSION

Stage 1 rooms of the former TRIGA Fuel Fabrication "Hot Suite" area formerly located in the northwest corner of the Experimental Building (Building 9) have been decontaminated to levels below the specified limits and therefore meet the criteria for release to unrestricted use.

REFERENCES

1. Asmussen, Keith E., letter #CAL-1095 to Mr. Ben Kapel, "Final Survey Report on the Decontamination of GA Technologies' Experimental Building", dated July 28, 1987.

2. Kapel, Ben R., letter to Keith E. Asmussen dated May 14, 1987. Docket #023087-0145, containing amendment #86 to GA's radioactive material license number 0145-80.

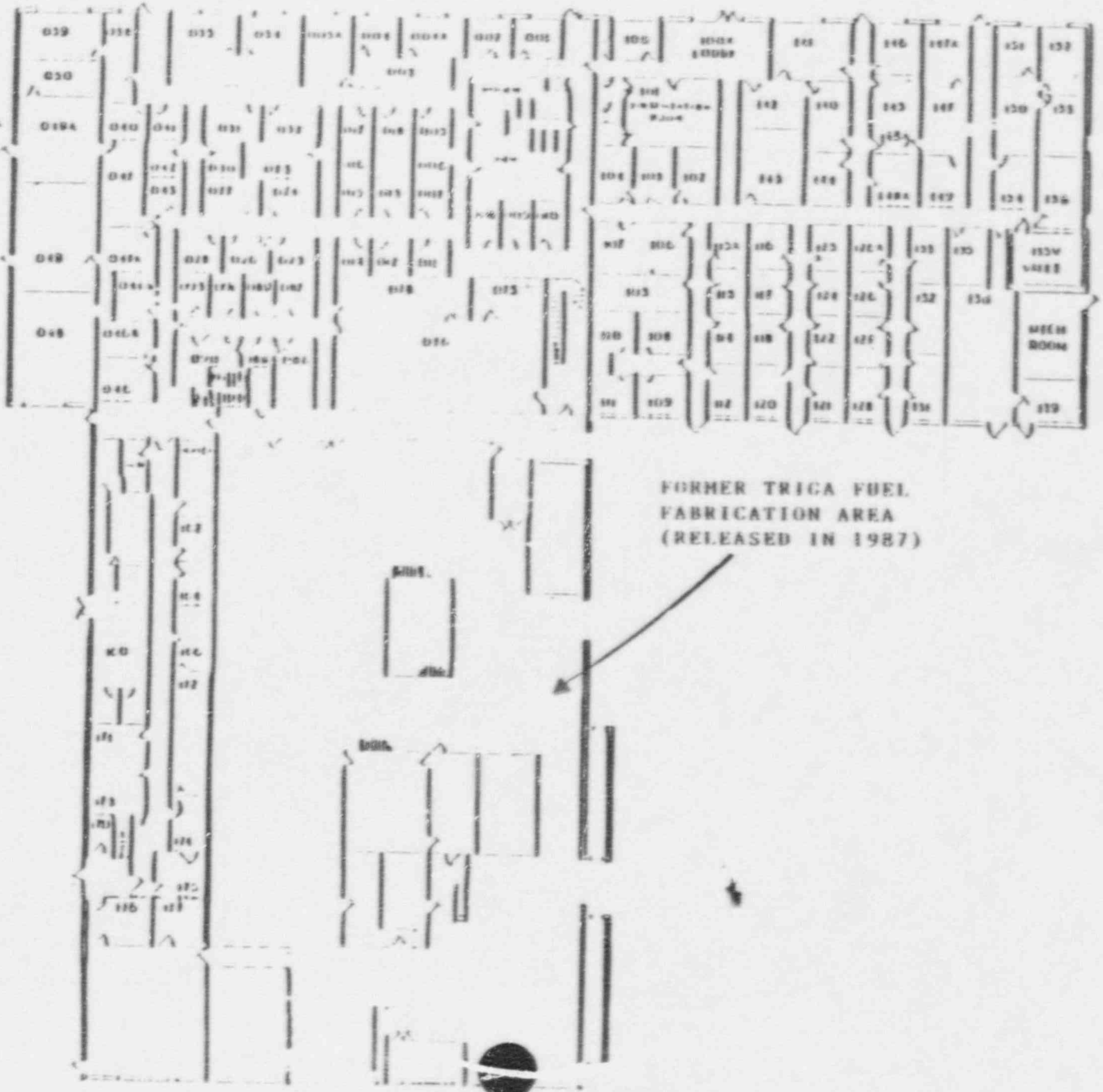
3. Montgomery, James L., letter dated October 1, 1987 to R. N. Rademacher, "Inspection at GA Technologies, Inc. (Confirmatory Survey), with Report No. 70-734/87-11.

4. Asmussen, Keith E., letter #CAL-1049 to Mr. Ben Kapel, "Decontamination of GA Technologies' Experimental Building," dated March 27, 1987.

5. Letter dated 8/5/75, J. M. Keith to F. O. Bold.

ATTACHMENT 1: Plan View of Sites

FORMER TRIGA
FUEL FABRICATION
"HOT SUITE" AREA
(~4036 ft^2)

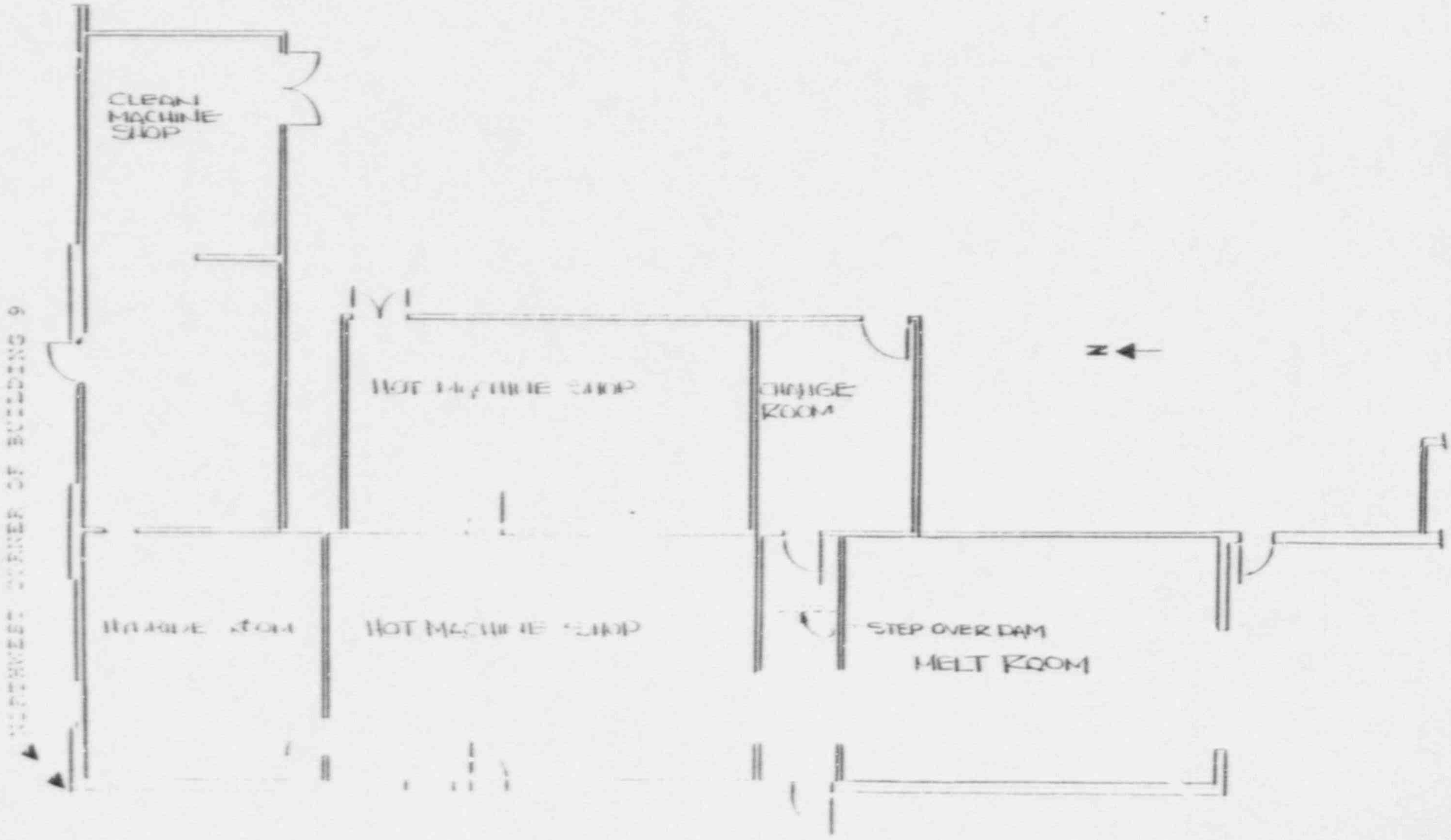


FORMER TRIGA FUEL
FABRICATION AREA
(RELEASED IN 1987)

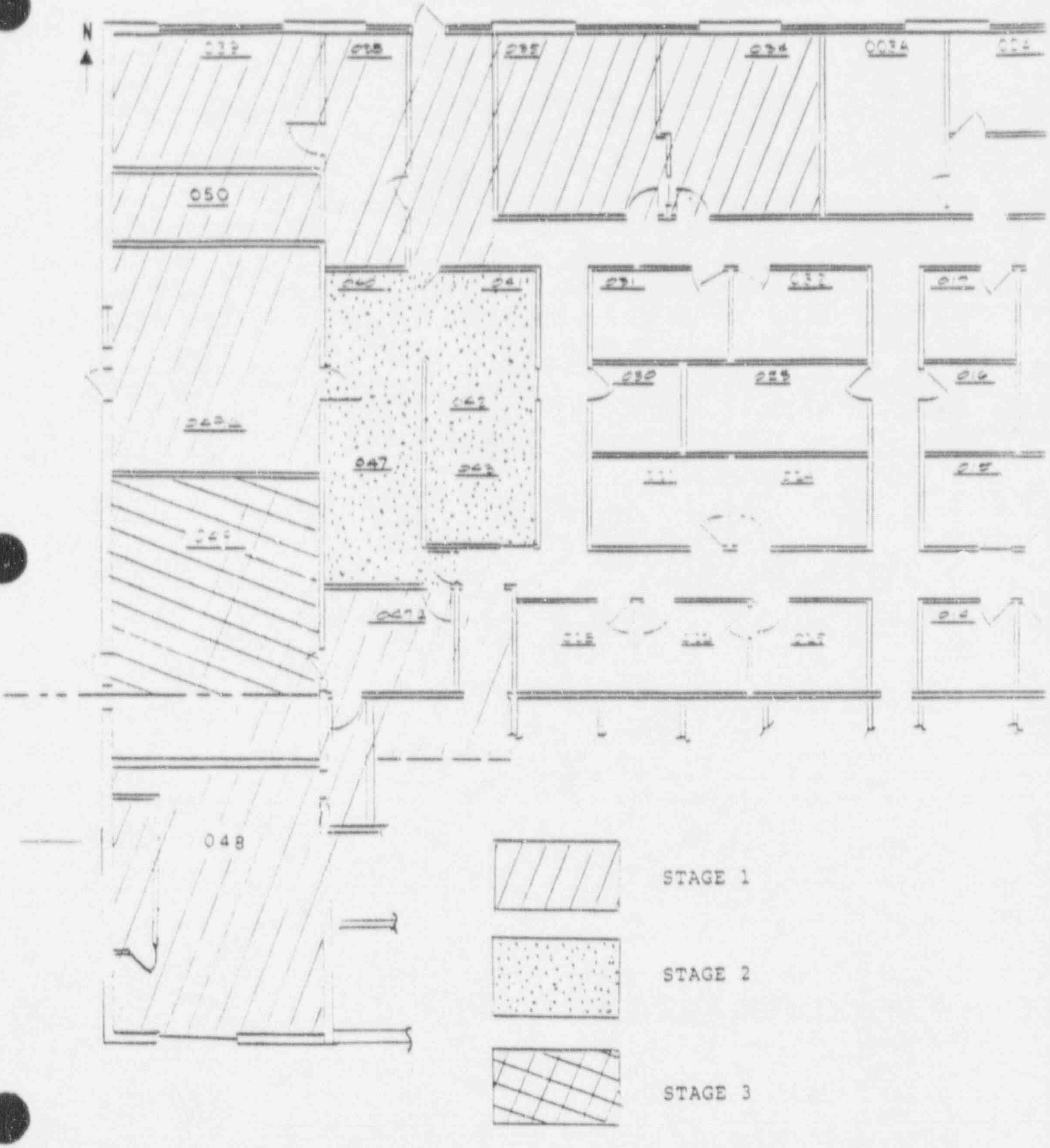
ATTACHMENT 2: FIRST FLOOR OF THE EXPERIMENTAL BUILDING SHOWING THE PREVIOUS

ATTACHMENT 3: CURRENT STATUS OF FORMER "HOT SUITE" AREA

ATTACHMENT 4A: FORMER "HOT SUITE" AREA OF BUILDING 9



ATTACHMENT 5: DECONTAMINATION STAGES FOR THE "HOT SUITE" AREA



ATTACHMENT 6A

TABLE I

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES[a]	AVERAGE[b c f]	MAXIMUM[b d f]	REMOVABLE[b e f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126 I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

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[a] Where surface contamination by both alpha and beta gamma-emitting nuclides exists, the limits established for alpha and beta gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

TABLE 1
ACCEPTABLE SURFACE CONTAMINATION LEVELS 1/ 2/

NUCLIDE[a]	AVERAGE[b, c] (dpm/100 cm^2)	MAXIMUM[b, d] (dpm/100 cm^2)	REMOVABLE[b, e] (dpm/100 cm^2)
a) U-nat, U-235, U-238, and associated decay products	5,000	15,000	1,000
b) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231 Ac-227, I-125, I-129	100	300	20
c) Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
d) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
e) H-3, C-14 except as DNA precursors f	20,000	60,000	4,000

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ere surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioact material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm^2.

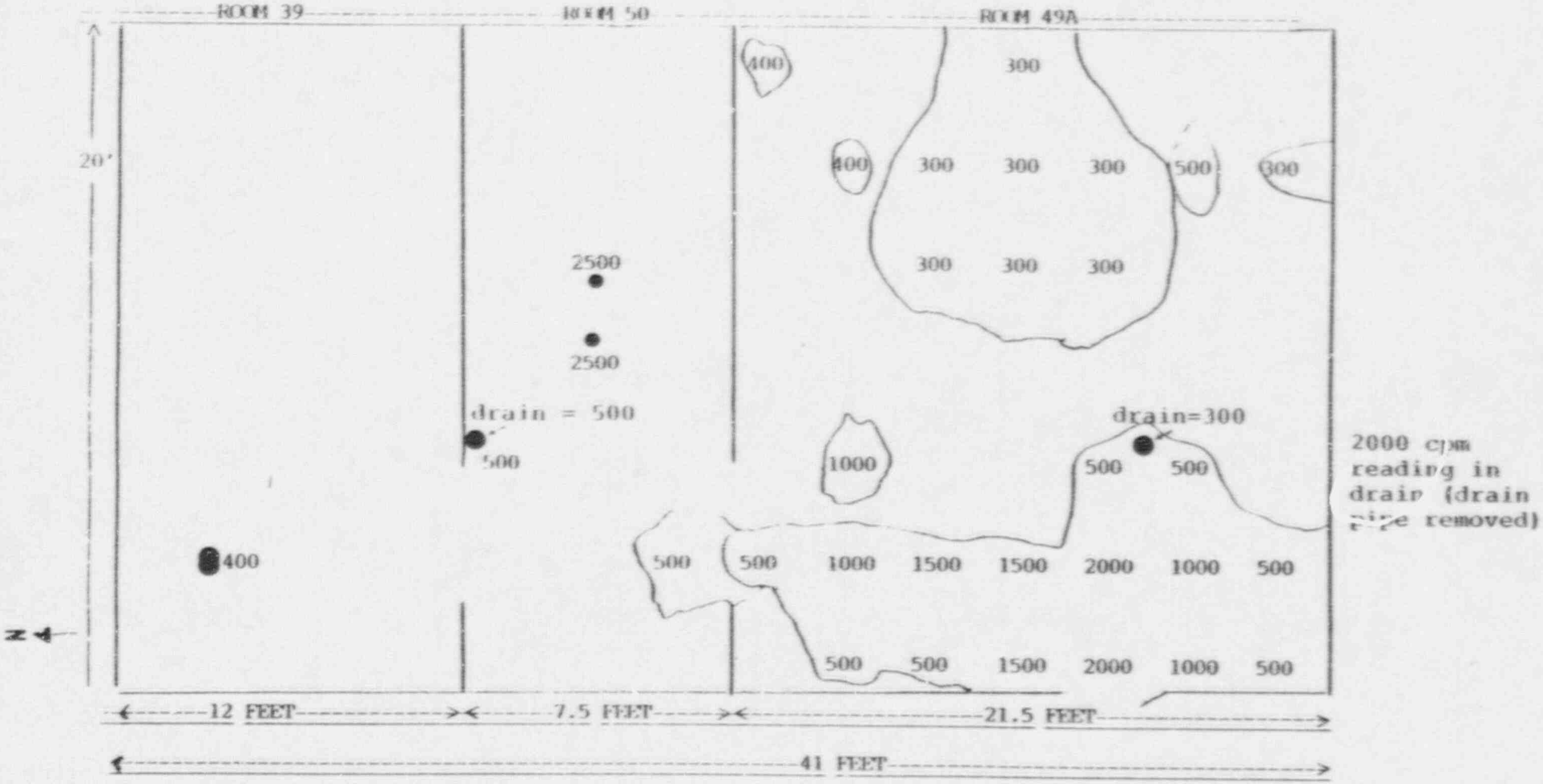
The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of kno efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

DNA precursors mean molecules or compounds that are directly incorporated into the DNA molecul during DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and nucleosides. The acceptable surface contamination levels for H-3 and C-14 in DNA precursors are as tabulated in paragraph (d) for beta-gamma-emitters.

USNRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, Washingt D.C. (June 1974)

ANSI Control of Radioactive Surface Contamination on Materials, Equipment and Facilities to be Released for Uncontrolled Use, final draft, proposed American National Standard N-13.12, Atomic Industrial Forum, Inc., N.Y. (June 1974)

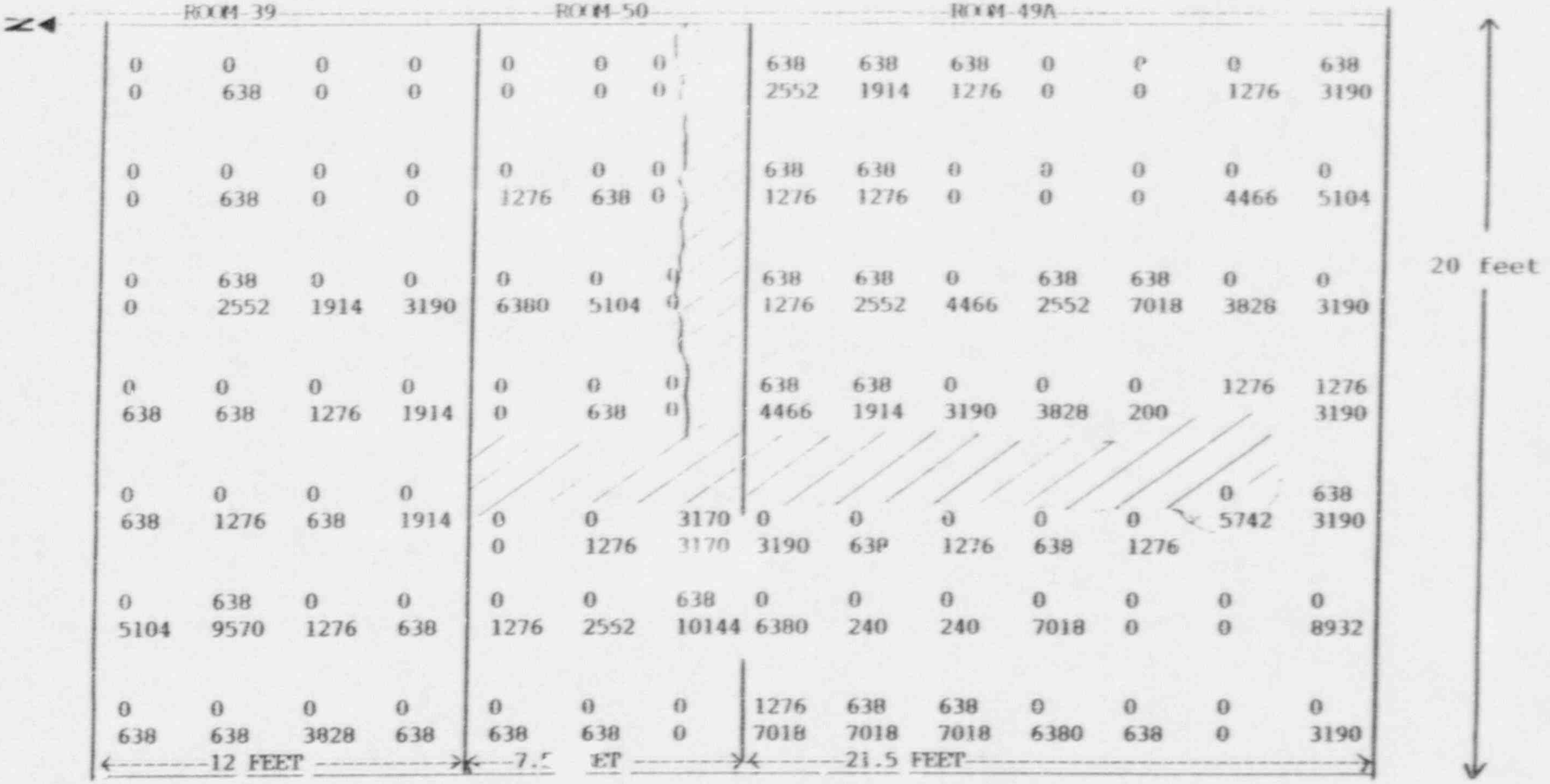
ATTACHMENT 7: INITIAL SURVEY OF ROOMS 39, 49A AND 50 OF "HOT SUITE AREA"



INITIAL SURVEYS OF ROOMS 39, 49A AND 50 OF "HOT SUITE" AREA COMPLETED 9/29/88 THROUGH 10/4/88.
USING GM COUNTER (TBM-28 #92238) CALIBRATED 8/26/88.

NOTES:
1. LEVELS WERE MEASURED ON CONCRETE FLOOR BEFORE CLEANING AFTER REMOVAL OF CARPET AND GLUE.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. VALUES ARE THE MAXIMUM BETA/GAMMA DIRECT READINGS IN CPM.
4. CIRCLED NUMBERS ARE MICROR/HOUR READINGS CONTACT.
5. APPROXIMATELY 205 SQUARE FEET REQUIRED DECONTAMINATION.
6. ALL OTHER AREAS MEASURED ABOUT 100 CPM.

ATTACHMENT 8: FINAL SURVEY ROOM 39, 49A AND 50 OF "HOT SUITE" AREA



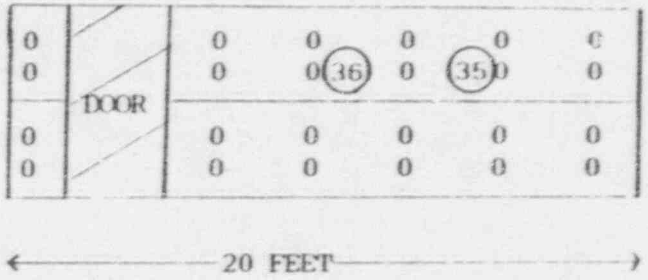
ROOM-39				ROOM-50			ROOM-49A						
0 0	0 638	0 0	0 0	0 0	0 0	0 0	638 2552	638 1914	638 1276	0 0	0 0	0 1276	638 3190
0 0	0 638	0 0	0 0	0 1276	0 638	0 0	638 1276	638 1276	0 0	0 0	0 0	0 4466	0 5104
0 0	638 2552	0 1914	0 3190	0 6380	0 5104	0 0	638 1276	638 2552	0 4466	638 2552	638 7018	0 3828	0 3190
0 638	0 638	0 1276	0 1914	0 0	0 638	0 0	638 4466	638 1914	0 3190	0 3828	0 200	1276	1276 3190
0 638	0 1276	0 638	0 1914	0 0	0 1276	3170 3170	0 3190	0 638	0 1276	0 638	0 1276	0 5742	638 3190
0 5104	638 9570	0 1276	0 638	0 1276	0 2552	638 10144	0 6380	0 240	0 240	0 7018	0 0	0 0	0 8932
0 638	0 638	0 3828	0 638	0 638	0 638	0 0	1276 7018	638 7018	638 7018	0 6380	0 638	0 0	0 3190
12 FEET				7.5 FT			21.5 FEET						

FINAL SURVEYS OF ROOMS 39, 49A AND 50 "HOT SUITE" AREA COMPLETED 11/1/88, USING GM COUNTER (TBM-28 #92238) CALIBRATED 8/26/88.

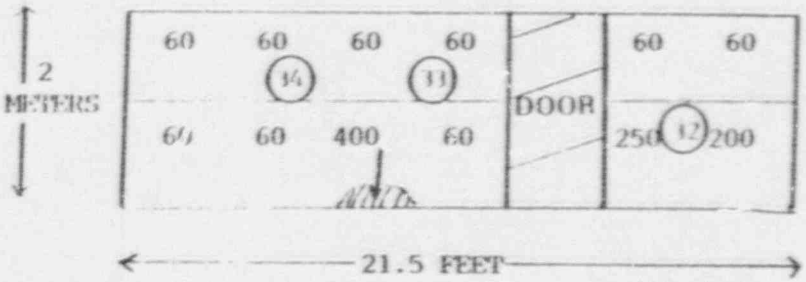
NOTES:
1. LEVELS WERE MEASURED ON CONCRETE FLOOR AFTER CLEANING/SCABBLING OF SURFACE.
2. EACH UNIT REPRESENTS A THREE FOOT BY THREE FOOT AREA OR LESS.
3. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM^2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
4. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM^2.
5. RADIATION LEVELS MEASURED ON SURFACE (IN MICROR/HR) ARE IN SQUARES.
6. APPROXIMATELY 205 FT^2 OF CONCRETE REQUIRED SCABBLING.
7. EXPOSED SOIL LOCATIONS SHOWN AS / / /

PAGE 1 OF 3

ATTACHMENT A: INITIAL AND FINAL SURVEYS OF ROOM 49A WALLS



FINAL SURVEY OF THE NORTH WALL
OF ROOM 49A



INITIAL SURVEY OF THE EAST WALL OF
ROOM 49A

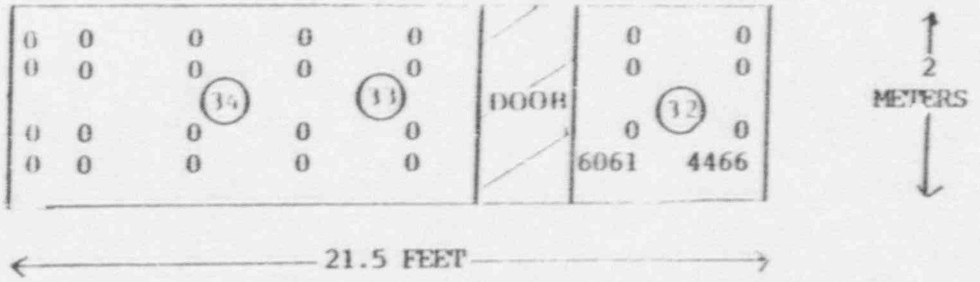
NOTES:

1. FINAL SURVEY OF THE NORTH WALL WAS COMPLETED ON 1/19/89 USING TBM-92238 CALIBRATED 8/26/88. NO CONTAMINATION WAS DETECTED.
2. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM^2 IN A ONE METER BY THREE FOOT AREA OR LESS.
3. THE BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM^2.
4. THE NUMBER IN THE CIRCLE IS THE WIPE SAMPLE LOCATION (SEE ATTACHMENT 16 FOR RESULTS).

NOTES:

1. INITIAL SURVEY OF THE EAST WALL OF ROOM 49A WAS COMPLETED ON 1/19/89 USING TBM-92238 CALIBRATED 8/26/88.
2. A TWO FEET SQUARED AREA WAS FOUND TO HAVE SOME CONTAMINATION (~400 CPM).
3. THE CONTAMINATION WAS REMOVED UNTIL READINGS WERE AT BACKGROUND LEVELS.
4. VALUES ARE PROVIDED IN COUNTS PER MINUTE (BETA/GAMMA LEVELS). THE VALUE PROVIDED IS THE HIGHEST LEVEL DETECTED IN A THREE FOOT BY THREE FOOT AREA.

ATTACHMENT 8A: INITIAL AND FINAL SURVEYS OF ROOM 49A WALLS

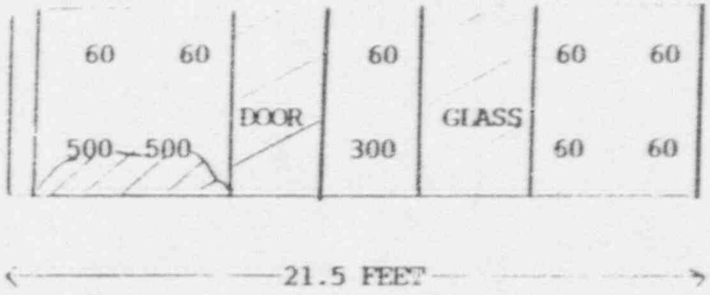


FINAL SURVEY OF THE EAST WALL OF ROOM 49A

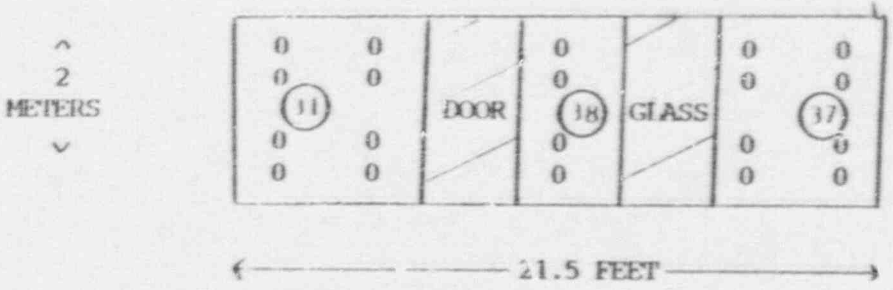
NOTES:

1. FINAL SURVEY COMPLETED 1/23/89 USING TBM-92238 CALIBRATED 8/26/88.
2. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM^2 IN A ONE METERBY THREE FOOT AREA OR LESS.
3. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM^2.
4. THE NUMBER IN THE CIRCLE IS THE WIPE SAMPLE LOCATION (SEE ATTACHMENT 16 FOR RESULTS).

ATTACHMENT 8A: INITIAL AND FINAL SURVEYS OF ROOM 49A WALLS



INITIAL SURVEY OF THE WEST WALL
OF ROOM 49A

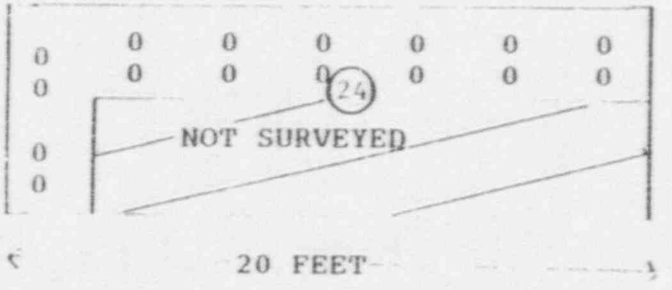


FINAL SURVEY OF WEST WALL OF
ROOM 49A

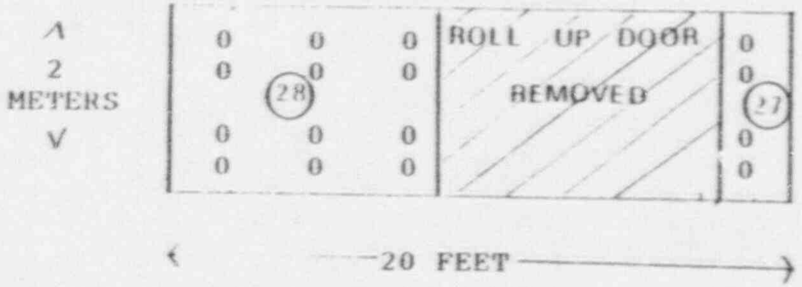
NOTES:
1. INITIAL SURVEY OF THE WEST WALL WAS COMPLETED ON 1/19/89 USING TBM-92238 CALIBRATED 8/26/88.
2. ABOUT 1.5 FEET SQUARED AREA OF WALL WAS CONTAMINATION (2 LOCATIONS) AND CLEANED.
3. THE VALUE IS THE HIGHEST READING IN A THREE FOOT BY THREE FOOT VALUE.

NOTES:
1. FINAL SURVEY OF THE WEST WALL OF ROOM 49A WAS COMPLETED ON 1/23/89 USING TBM-92238 CALIBRATED 8/26/88.
2. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM^2 IN A ONE METER BY THREE FOOT AREA OR LESS.
3. THE BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM2
4. NUMBER IN CIRCLE IS THE WIPE SAMPLE LOCATION (SEE ATTACHMENT 16 FOR RESULTS).

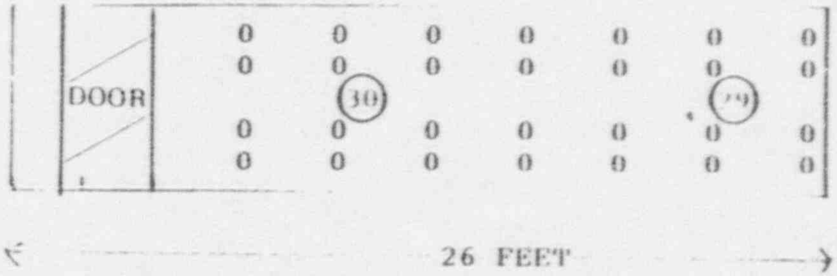
ATTACHMENT 8B: FINAL SURVEYS OF ROOM 48 WALLS



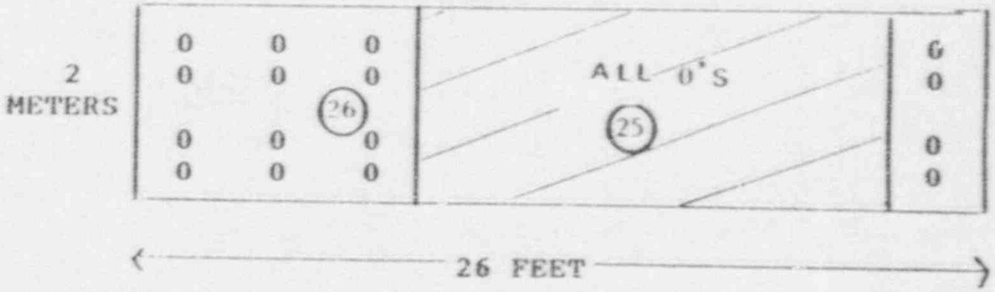
NORTH WALL



SOUTH WALL



EAST WALL

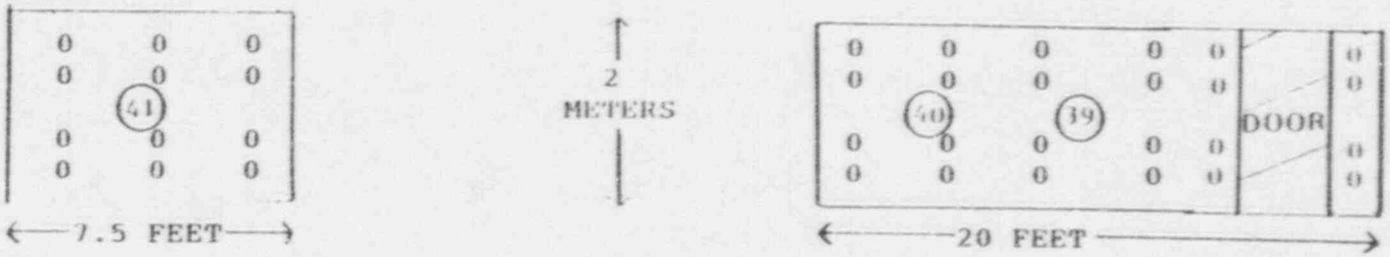


WEST WALL

NOTES:

1. FINAL SURVEYS WERE COMPLETED USING TBM-28 #108113 CALIBRATED 10/31/88.
2. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM^2 IN A ONE METER BY THREE FOOT AREA OR LESS.
3. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM^2.
4. NO CONTAMINATION WAS DETECTED ON ANY OF THE WALLS SURVEYED.
5. THE ROLL-UP DOOR ON THE SOUTH WALL HAS BEEN REMOVED AND NEW PLYWOOD INSTALLED. NO MEASUREMENTS WERE MADE.
6. PART OF THE NORTH AND WEST WALLS HAVE BEEN COVERED OVER. THESE COVERINGS WERE NOT REMOVED BECAUSE CONTAMINATION NOT WAS DETECTED IN ANY OF THE OTHER WALLS SURVEYED.
7. BACKGROUND BETA/GAMMA LEVELS WERE ~60 COUNTS PER MINUTE (CPM).
8. THE VALUE IN THE CIRCLE IS THE WIPE SAMPLE LOCATION (SEE ATTACHMENT 16 FOR RESULTS).

ATTACHMENT 8C: FINAL SURVEYS OF ROOM 50 WALLS



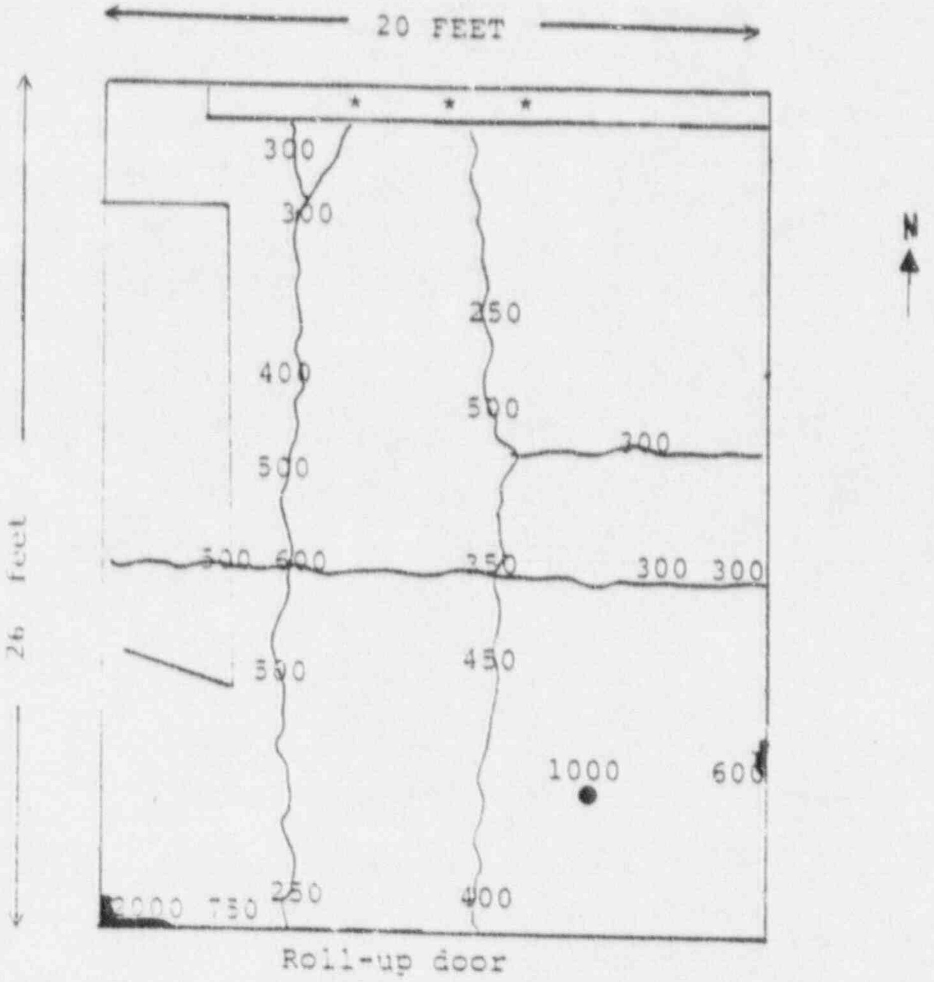
EAST WALL

SOUTH WALL

NOTES:

1. FINAL SURVEYS WERE COMPLETED USING TBM-28 #108113 CALIBRATED 10/31/88.
2. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM^2 IN A ONE METER BY THREE FOOT AREA OR LESS.
3. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM^2.
4. NO CONTAMINATION WAS DETECTED ON ANY OF THE WALLS SURVEYED.
5. THE SOUTH WALL IS A "NEW" WALL. NO WALL EXISTED DURING "HOT SUITE" ACTIVITIES.
6. THE VALUE IN THE CIRCLE IS THE WIPE SAMPLE LOCATION (SEE ATTACHMENT 16 FOR RESULTS).

ATTACHMENT 9: INITIAL SURVEY OF ROOM 48



(100 - 10,000 cpm; removed roll-up door)

NOTES:

1. The initial survey was completed 5/24/28 using TBM-28 (#92238), calibrated 4/21/88.

2. Values are present in counts per minute (cpm); (beta/gamma activity)

3. Contamination was detected in cracks along the concrete floor. Values ranged from 250 to 1000 cpm except for the roll-up door which measured as high as 10,000 cpm. The roll-up door was removed and disposed of as "hot waste.

4. Other areas on concrete floor read around 200 cpm.

** Unable to survey (electrical equipment for computers) -- to be done with Stage 3.

ATTACHMENT 10: FINAL SURVEY OF ROOM 48

<------------20 FEET------------->

	1250	1250	1500	1250	1250	1250	1250
	1250	1250	2500	2500	5000	1250	1250
20	1250	1250	1250	1250	1250	1250	1250
	1250	1250	1250	1250	1250	1250	1250
FT	1250	1250	1250	1250	1250	1250	1250
	1250	1250	1250	1250	1250	1250	1250
v	1250	1250	1250	1250	1250	1250	1250
	1250	1250	1250	1250	1250	1250	1875
	1250	1250	1250	1250	1250	1250	1625
	1250	1250	1250	1250	1250	1250	1625
	1250	1250	1250	1250	1250	1250	1625
	1250	1250	1250	1500	1250	1250	1625
	1250	1250	1250	1250	1875	1250	1250
	1250	1250	1250	1250	1875	5000	1250
	1875	1250	1250	1250	1250	1250	1250
	3750	1250	1250	1250	1250	5500	1250
	1500	1500	1500	1500	1500	1500	1250
	1500	1500	3000	1500	1500	5000	1250

Small area along the north wall to be done with Stage

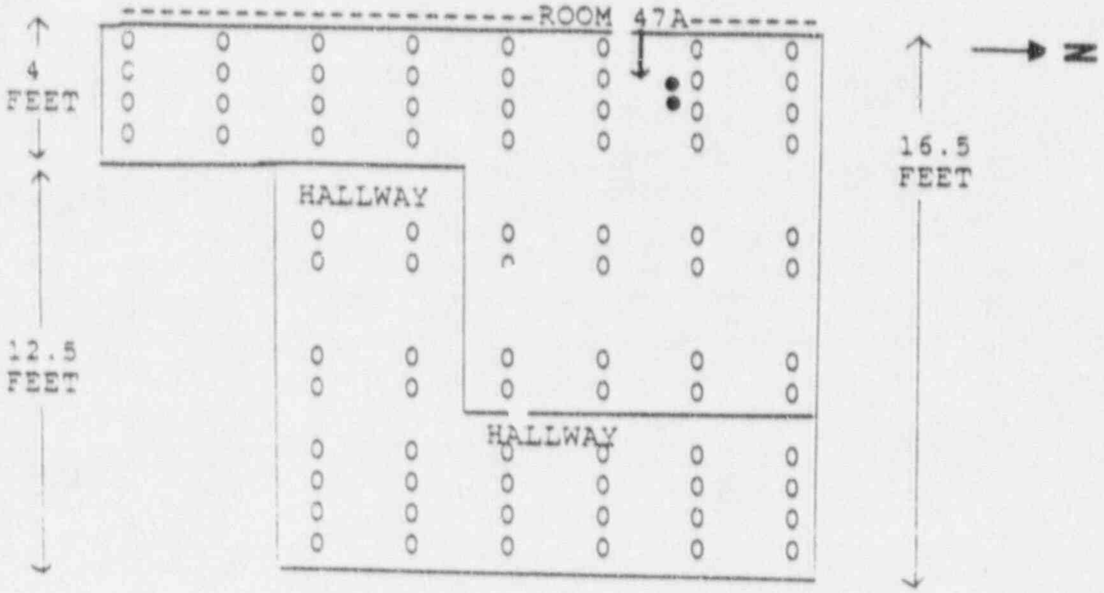
N ↑

Concrete along the area where the roll-up door was located was scabbled as well as some areas outside.

NOTES:

1. FINAL SURVEY OF ROLL UP DOOR AREA COMPLETED 8/18/88 USING TBM-28 (#2759) CALIBRATED 6/24/88.
2. FINAL SURVEY OF THE REST OF THE ROOM COMPLETED ON 1/9/89 AND 1/12/89 USING TBM-28 (#108113) CALIBRATED 10/31/88.
3. LEVELS WERE MEASURED ON CONCRETE FLOOR AFTER SCABBLING (WHEN NECESSARY).
4. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM^2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
5. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM^2.
6. THE CONCRETE ALONG THE CRACKS IN THE FLOOR WAS SCABBLED TO LEVELS BELOW THE TABLE 1 LIMITS.

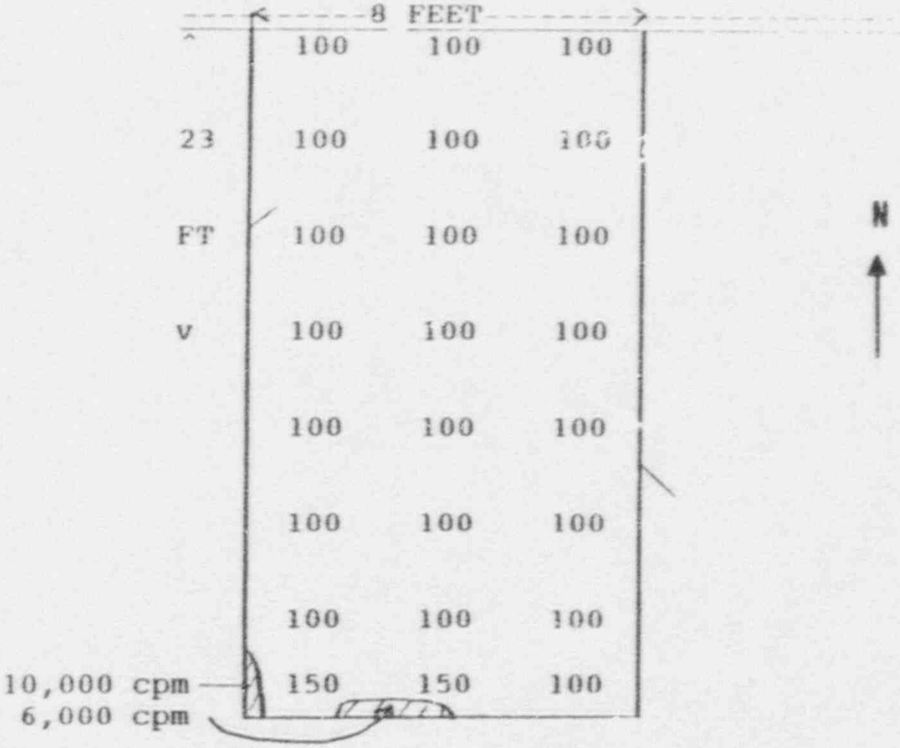
ATTACHMENT 11: FINAL SURVEY OF ROOM 47A AND HALWAY EAST AND SOUTH OF ROOM 47A



NOTES:

1. FINAL SURVEY OF ROOM 47A AND HALLWAY AREAS COMPLETED 1/13/89 USING TBM #108113, CALIBRATED 10/31/88.
2. READINGS IN ROOM 47A WERE TAKEN ON CONCRETE; READINGS IN HALLWAY WERE TAKEN ON CARPET. THESE AREAS WERE PREVIOUSLY THE "CHANGE ROOM" DURING "HOT SUITE" OPERATIONS.
3. INITIAL SURVEY SHOWED TWO SPOTS IN ROOM 47 (NOTED AS •) READINGS ABOUT 300 COUNTS PER MINUTE (CPM). THESE SPOTS WERE SCABBLED UNTIL READINGS WERE AT BACKGROUND LEVELS.
4. TOP VALUE IS THE AVERAGE BETA/GAMMA DIRECT READING IN DPM/100 CM^2 IN A THREE FOOT BY THREE FOOT AREA OR LESS.
5. BOTTOM VALUE IS THE MAXIMUM BETA/GAMMA DIRECT READING IN DPM FOR AN AREA <100 CM^2.

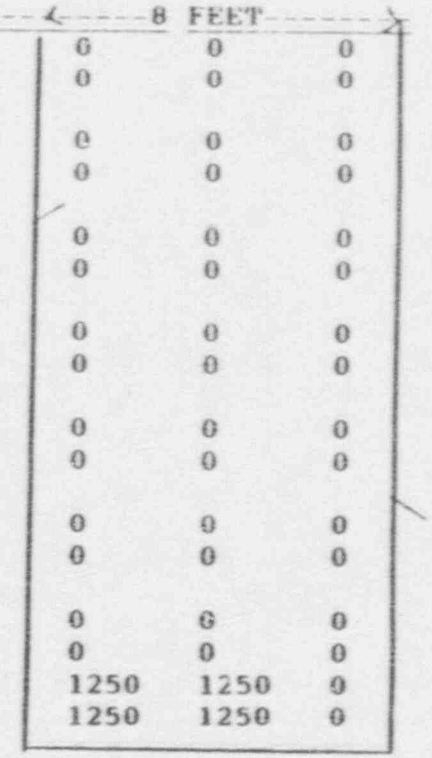
ATTACHMENT 12: INITIAL AND FINAL SURVEY OF ROOM 38



100	100	100
100	100	100
100	100	100
100	100	100
100	100	100
100	100	100
100	100	100
150	150	100

INITIAL SURVEY OF ROOM 38

NOTES:
1. Initial survey completed 1/12/89 using TBM-28 #108113 calibrated 10/31/88 after carpet and glue were removed.
2. All values are in counts per minute (beta/gama).
3. Two areas against walls were contaminated. The area against the south wall read ~6000 cpm; the area against the southwest wall read ~10,000 cpm.

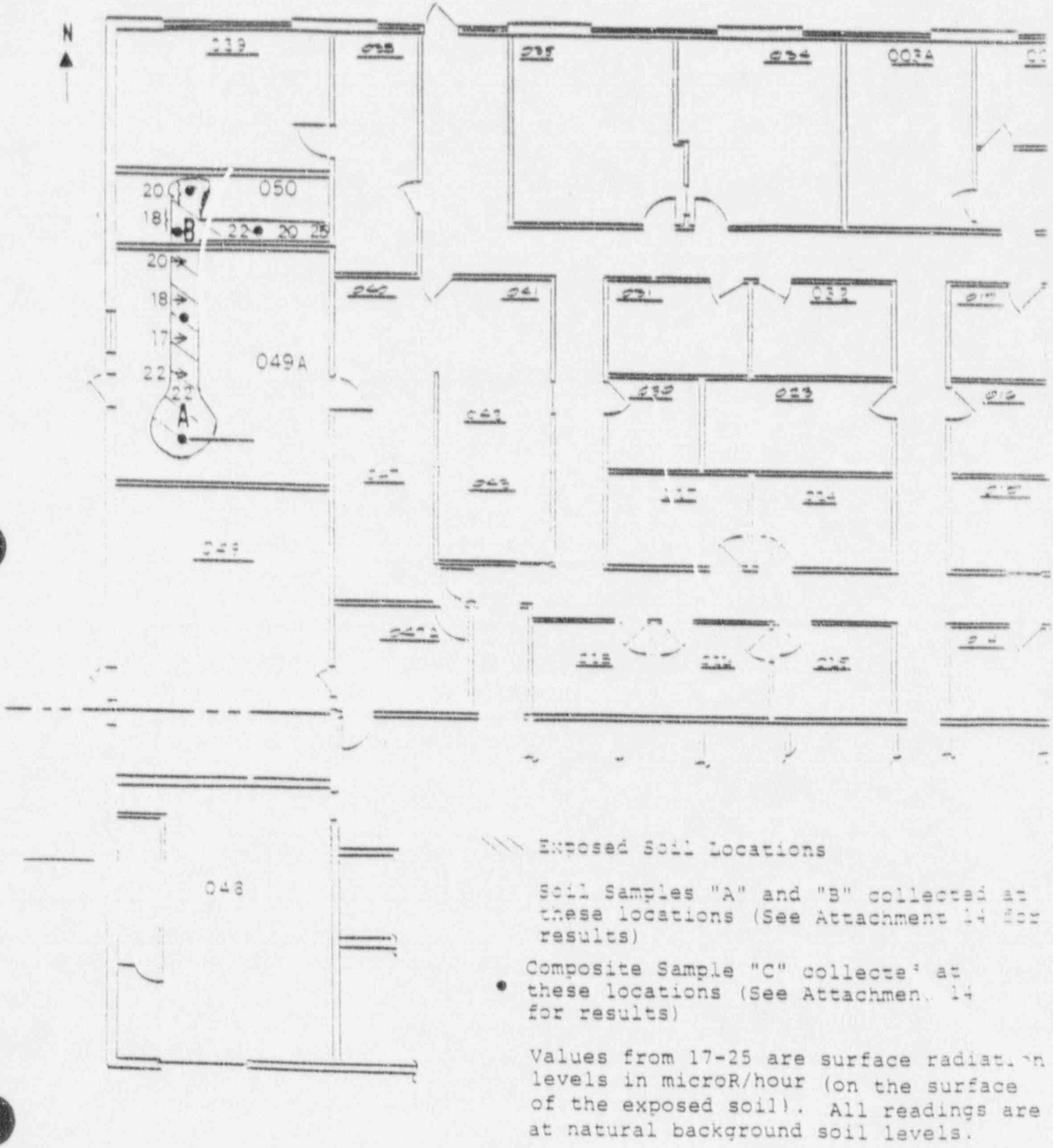


0 0	0 0	0 0
0 0	0 0	0 0
0 0	0 0	0 0
0 0	0 0	0 0
0 0	0 0	0 0
0 0	0 0	0 0
0 0	0 0	0 0
1250 1250	1250 1250	0 0

FINAL SURVEY OF ROOM 38

NOTES:
1. Final survey completed 1/12/89 using TBM-28 #108113 calibrated 10/31/88
2. About 1 foot square of concrete against the south wall and 1 foot square of concrete against the southwest wall was scabbled.
3. Each unit represents a three foot by three foot area or less.
4. Top value is the average beta/gamma direct reading in DPM/100 cm^2 in a three foot by three foot area or less.
5. Bottom value is the maximum beta/gamma direct reading in dpm for an area <100 cm^2.

ATTACHMENT 13: SOIL SAMPLE LOCATIONS AND RADIATION READINGS ON SOIL



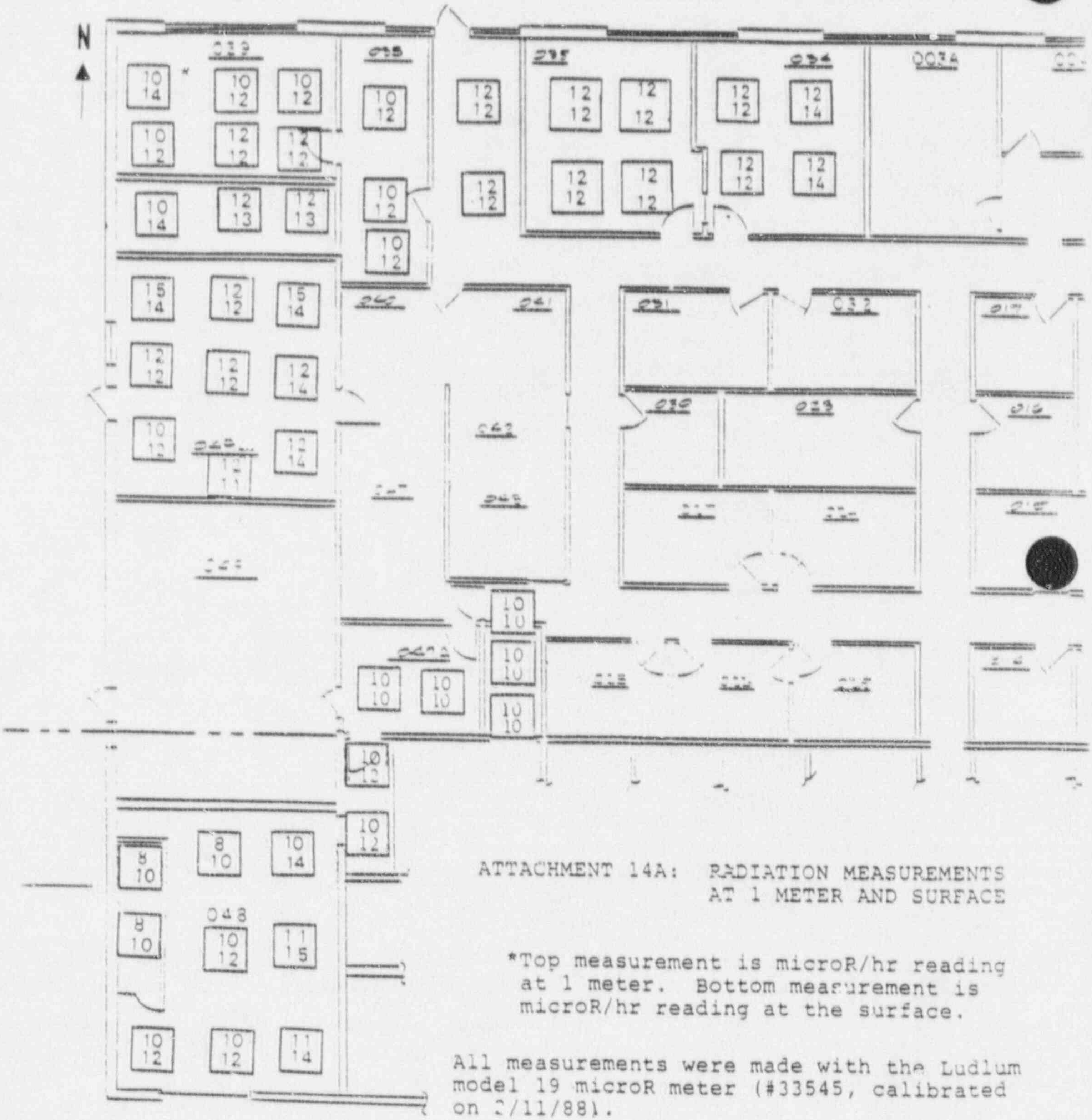
\\\ Exposed Soil Locations

Soil Samples "A" and "B" collected at these locations (See Attachment 14 for results)

● Composite Sample "C" collected at these locations (See Attachment 14 for results)

Values from 17-25 are surface radiation levels in microR/hour (on the surface of the exposed soil). All readings are at natural background soil levels.

ATTACHMENT 14A: RADIATION MEASUREMENTS AT 1 METER AND SURFACE

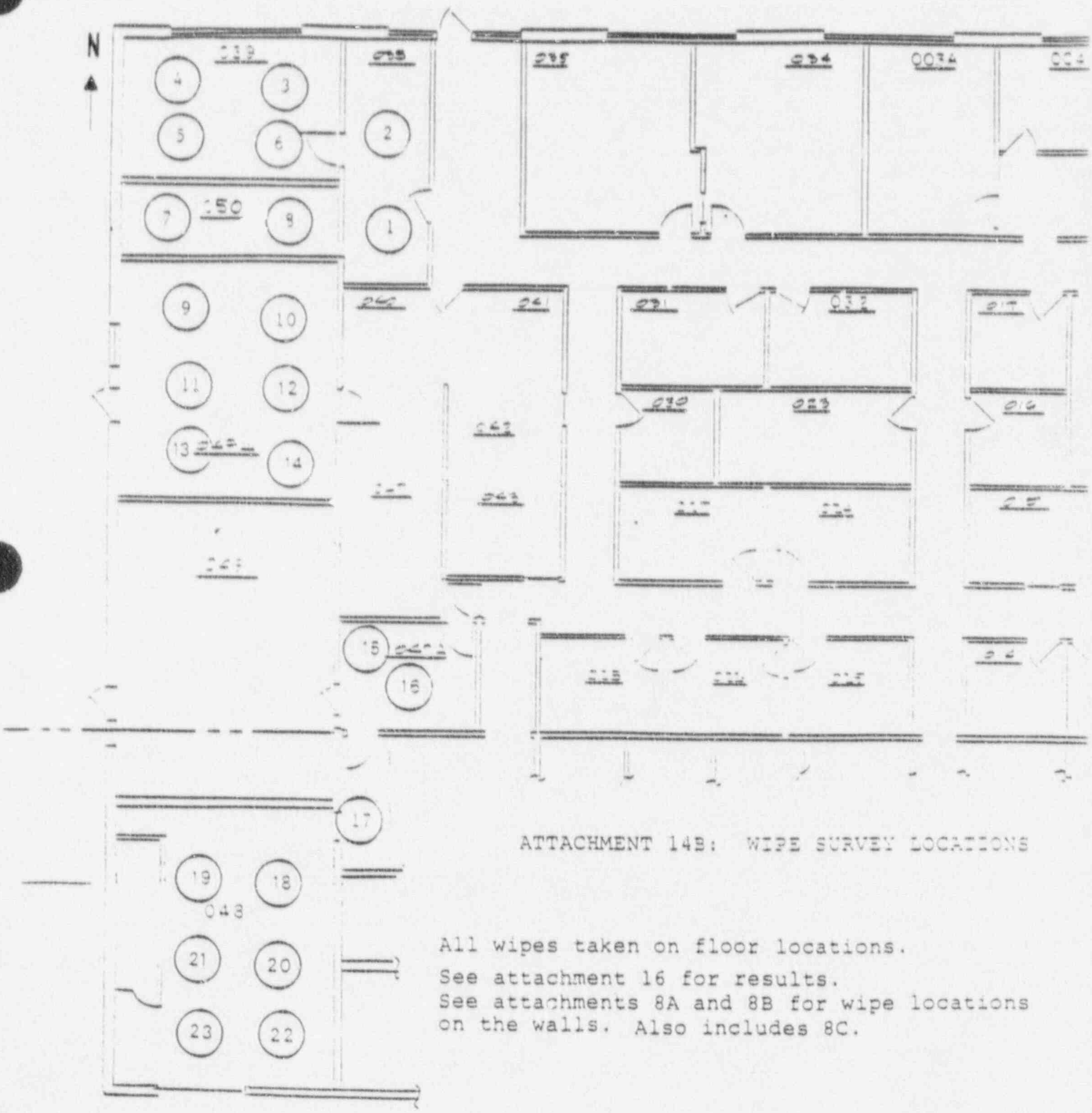


ATTACHMENT 14A: RADIATION MEASUREMENTS
AT 1 METER AND SURFACE

*Top measurement is microR/hr reading at 1 meter. Bottom measurement is microR/hr reading at the surface.

All measurements were made with the Ludlum model 19 microR meter (#33545, calibrated on 2/11/88).

ATTACHMENT 14B: WIPE SURVEY LOCATIONS



ATTACHMENT 14B: WIPE SURVEY LOCATIONS

All wipes taken on floor locations.

See attachment 16 for results.
See attachments 8A and 8B for wipe locations on the walls. Also includes 8C.

ATTACHMENT 15

SOIL SAMPLE SAMPLE RESULTS

Sample ID #	Radionuclide Concentration (pCi/g)						
	Co-60	Cs-137	Th 228	Ra 228	Ra-226	U-238	U-235
A*	ND**	ND	1.12 ± 0.03	1.10 ± 0.06	0.08 ± 0.05	2.23 ± 1.49	0.10 ± 0.04
B	ND	0.02 ± 0.01	0.85 ± 0.03	0.91 ± 0.11	0.78 ± 0.05	1.67 ± 0.13	0.10 ± 0.04
C	ND	0.02 ± 0.01	1.36 ± 0.04	1.36 ± 0.07	1.07 ± 0.06	ND	0.08 ± 0.04
Background Soil***	ND	0.14 ± 0.09	1.40 ± 0.2	1.40 ± 0.02	0.90 ± 0.20	2.00 ± 2.00	0.09 ± 0.05

* See Attachment 13 for soil sample locations.

** ND= Not Detectable means:

Cs-137 = <0.01 pCi/gram

Co-60 = <0.01 pCi/gram

U-238 = <3.0 pCi/gram

*** Background Soil samples - see reference IRQ:84:135.

ATTACHMENT 16: GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE I.D.	COUNT LENGTH MIN	ALPHA DPM/100 SQ. CM.	%ERROR 95% CL	BETA DPM/100 SQ. CM.	% ERROR 95% CL
1 RM 38 FLOOR	1	<9.386e-03	95.00	<4.054e-01	95.00
2 RM 38 FLOOR	1	<9.386e-03	95.00	<1.447e-00	95.00
3 RM 39 FLOOR	1	<9.386e-03	95.00	<1.447e-00	95.00
4 RM 39 FLOOR	1	<9.386e-03	95.00	<9.520e-01	95.00
5 RM 39 FLOOR	1	2.897e-01	222.75	<3.167e-02	95.00
6 RM 39 FLOOR	1	<9.386e-03	95.00	<9.520e-01	95.00
7 RM 50 FLOOR	1	2.897e-01	222.75	<1.447e-00	95.00
8 RM 50 FLOOR	1	6.189e-01	147.45	1.435e+00	108.95
9 RM 49A FLOOR	1	2.897e-01	222.75	<9.520e-01	95.00
10 RM 49A FLOOR	1	2.897e-01	222.75	<1.447e-00	95.00
11 RM 49A FLOOR	1	<9.386e-03	95.00	<9.520e-01	95.00
12 RM 49A FLOOR	1	2.897e-01	222.75	<9.520e-01	95.00
13 RM 49A FLOOR	1	2.897e-01	222.75	<4.054e-01	95.00
14 RM 49A FLOOR	1	<9.386e-03	95.00	<3.167e-02	95.00
15 RM 47A HALL AND FLOOR	1	2.897e-01	222.75	<4.054e-01	95.00
16 RM 47A HALL & FLOOR	1	<9.386e-03	95.00	<9.520e-01	95.00

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

ATTACHMENT 16: GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE I.D.	COUNT LENGTH MIN	ALPHA DPM/100 SQ. CM.	%ERROR 95% CL	BETA DPM/100 SQ. CM.	% ERROR 95% CL
17 RM 47A HALL & FLOOR	1	<9.386e-03	95.00	<4.054e-01	95.00
18 RM 48 FLOOR	1	<9.386e-03	95.00	<3.167e-02	95.00
19 RM 48 FLOOR	1	<9.386e-03	95.00	<3.167e-02	95.00
20 RM 48 FLOOR	1	<9.386e-03	95.00	<4.054e-01	95.00
21 RM 48 FLOOR	1	<9.386e-03	95.00	<4.054e-01	95.00
22 RM 48 FLOOR	1	<9.386e-03	95.00	<9.520e-01	95.00
23 RM 48 FLOOR	1	2.897e-01	222.75	<9.520e-01	95.00
24 RM 48 WALLS	1	2.897e-01	222.75	<9.520e-01	95.00
25 RM 48 WALLS	1	<9.386e-03	95.00	<4.054e-01	95.00
26 RM 48 WALLS	1	<9.386e-03	95.00	<1.447e-00	95.00
27 RM 48 WALLS	1	<9.386e-03	95.00	<4.054e-01	95.00
28 RM 48 WALLS	1	<9.386e-03	95.00	<3.167e-02	95.00
29 RM 48 WALLS	1	<9.386e-03	95.00	<1.447e-00	95.00
30 RM 48 WALLS	1	<9.386e-03	95.00	<4.054e-01	95.00
31 RM 49A WALLS	1	2.897e-01	222.75	<4.054e-01	95.00
32 RM 49A WALLS	1	<9.386e-03	95.00	<9.520e-01	95.00

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

ATTACHMENT 16: GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE I.D.	COUNT LENGTH MIN	ALPHA DPM/100 SQ. CM.	%ERROR 95% CL	BETA DPM/100 SQ. CM.	% ERROR 95% CL
33 RM 49A WALLS	1	<9.386e-03	95.00	<9.520e-01	95.00
34 RM 49A WALLS	1	2.897e-01	222.75	<3.167e-02	95.00
35 RM 49A WALLS	1	<9.386e-03	95.00	<3.167e-02	95.00
36 RM 49A WALLS	1	<9.386e-03	95.00	<4.054e-01	95.00
37 RM 49A WALLS	1	2.897e-01	222.75	<9.520e-01	95.00
38 RM 49A WALLS	1	<9.386e-03	95.00	<9.520e-01	95.00
39 RM 50 WALLS	1	1.277e+00	101.03	1.049e+00	136.30
40 RM 50 WALLS	1	<9.386e-03	95.00	1.821e+00	92.61
41 RM 50 WALLS	1	6.189e-01	147.45	1.110e+00	128.64
42 AVERAGE		1.521e-01		7.599e-01	
43 HIGH		1.277e+00		1.821e+00	
44 LOW		9.386e-03		3.167e-02	

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

GENERAL ATOMICS
P. O. Box 85608
San Diego, CA 92138-5608
(619) 455-3000

FAX No.: (619) 455-2822
Verify: (619) 455-3281

FACSIMILE COVER SHEET

DATE OF TRANSMITTAL: 2/28/89

NO. OF PAGES: 3 including cover sheet

ATTENTION: MR. RAYMOND FISH

FAX No. (415) 943 - 3888
Verify No.

FROM: Keith Asmussen
Licensing, Safety and Nuclear Compliance

(619) 455-2823

SUBJECT: CONFIRMATORY SURVEY OF ADDITIONAL LAB SPACE

COMMENTS: GENERAL ATOMICS HAS COMPLETED DECONTAMINATION OF ~620 ft^2 OF ADDITIONAL LAB SPACE. WE HEREBY REQUEST THAT IT BE INCLUDED IN THE ORAU'S SITE ASSESSMENT TEAM'S CONFIRMATORY SURVEY OF GA FACILITIES NOW EXPECTED TO OCCUR ~ MID-TO-LATE MARCH. THE ATTACHED PAGES DESCRIBE THIS ADDITIONAL LAB SPACE. WHEN GA'S FINAL SURVEY REPORT IS COMPLETED WE WILL EXPRESS MAIL IT TO YOU FOR NRC AND ORAU REVIEW PRIOR TO ORAU'S ARRIVAL AT GA'S SITE. WE APPRECIATE YOUR ASSISTANCE IN THIS REGARD.

IE07D

Draft Summary
2/27/89

Summary of the Decontamination of LABS 307/309 for release to unrestricted use

Labs 307/309 are located in the Laboratory B section of General Atomic's Building 2. These labs had drain lines connected to an underground tank called the "L-307 tank". This tank and surrounding contaminated soil were removed in 1984. The drain line from the tank to Lab 307/309 was capped off when the tank was removed.

During the past few months, the drain line to the laboratory was removed and decontamination efforts to release labs 307/309 to unrestricted use began.

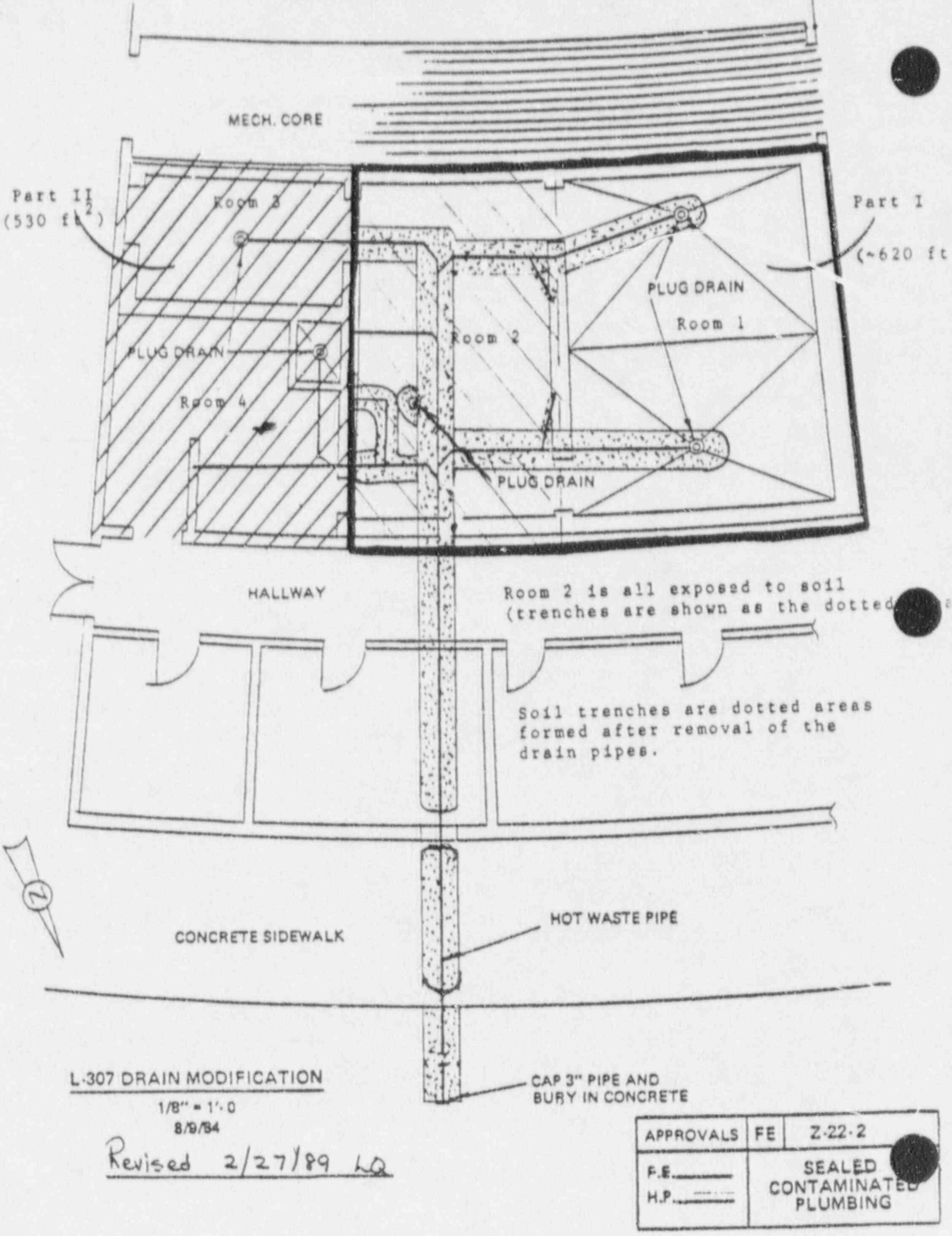
These efforts are being completed in two parts. The labs (shown in the attachment) occupy an area of approximately 1150 ft^2. Part I consists of two rooms (rooms 1 and 2) having an area of about 620 ft^2. Part II (rooms 3 and 4) also consists of two rooms and has an area of about 530 ft^2.

We have finished decontamination of Part I and would like a confirmatory survey completed so we can refurbish the area. Additional information is provided below:

The underground drain pipe was removed in all of the Part I areas shown in the attached drawing. A trench was formed by the removal of the pipe shown as the dotted areas in the drawing. Soil samples collected inside the rooms showed some soil contamination below the pipe (indications are that the pipe had rusted resulting in some soil contamination). The predominant radionuclides found in the soil were Cs-137, Co-60 and Sr-90. Forty-four drums (55 gallon) of soil were removed from the trenches. Confirmatory soil samples collected after removal of the soil were analyzed. Concentration values for both Cs-137 and Co-60 were found to be well below the criteria previously approved by NRC. We are awaiting final soil sample results for Sr-90 and are expecting the values to be < 100 pCi/gram. This is because samples collected before cleanup was completed were analyzed to have < 300 pCi/gram. Since the limit for Sr-90 is 1800 pCi/gram (Option 1 criteria limit for inhalation dose), we should meet the criteria. The surface radiation levels are <10 microR/hr above background at one meter.

In room 1 (~350 ft^2), the concrete floor areas which would need to be surveyed represent about 318 ft^2; the rest of the floor area (about 32 ft^2) are soil trenches). In room 2 (~270 ft^2), the concrete was removed completed from the floor surface so the entire area is exposed to soil. The soil trenches in the room are shown in the drawing.

LABORATORIES 307/309



Room 2 is all exposed to soil
(trenches are shown as the dotted

Soil trenches are dotted areas formed after removal of the drain pipes.

Revised 2/27/89 LQ

GENERAL ATOMICS

August 31, 1989
696-1443

Mr. R. F. Fish
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Subject: Docket No. 70-734: SNM-696; Request for Confirmatory Survey (Experimental Building - Stage 2)

References:
1) Asmussen, Keith E., letter No. 696-1337 to Robert D. Thomas, "Request for Confirmatory Survey (Experimental Building - Stage 1)," dated January 30, 1989

2) Yuhas, Gregory P., letter to R. N. Rademacher, "NRC Inspection" (with ORAU Final Report ORAU 89/F-98 dated July 1, 1989) dated August 18, 1989

Dear Mr. Fish:

As you are aware, General Atomics (GA) has been involved in the process of decontaminating and obtaining the release to unrestricted use of certain of its facilities (i.e., facilities for which GA has no plans for conducting future activities involving the use of radioactive materials). In late 1988, GA began surveying and decontaminating another portion of its Experimental Building (a.k.a. the E-Building or Building 9) where certain TRIGA fuel fabrication operations had been conducted until about 1975. This area is located in the northwest corner of Building 9, and prior to 1975 was referred to as the "Hot Suite" area. Note, however, that not all rooms referred to as being a part of the "Hot Suite" area were involved with the use of radioactive material.

The "Hot Suite" area of Building 9 is occupied by equipment and personnel. Since it is not feasible to move all equipment and/or personnel from the entire area at one time, GA is proceeding to survey, decontaminate and seek release of the area in three (3) stages.

IE07
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~~8910030484 890831~~
PDR ADOCK 07000734
C PNU

10955 JOHN JAY HOPKINS DRIVE SAN DIEGO CA 92121-1194 PO BOX 85608 SAN DIEGO CA 92138-5608 619 455-3000

In January 1989, GA completed its efforts on Stage 1. At that time, GA's final survey results were documented in a report and submitted to the NRC (Ref. 1) and the State of California along with a request for a confirmatory survey. The Oak Ridge Associated Universities Radiological Site Assessment Team, under contract to the NRC, conducted a confirmatory survey of the Stage 1 area March 14-23, 1989, and concluded that the area did indeed meet the criteria for release to unrestricted use (Ref. 2).

Decontamination of the second stage, i.e., "Stage 2" area, has now been completed. The results of GA's final radiation and contamination surveys are documented in the enclosed report titled, *"Decontamination of the "Hot Suite" Area of the TRIGA Fuel Fabrication Facility Formerly Located in Building 9 for Release to Unrestricted Use - Stage 2."* This report is being provided to assist you in planning for a confirmatory survey and in support of the subsequent release of the subject facilities to unrestricted use. The only observed containment was uranium, with the U^{235} enrichment ranging from about 3% to about 10%. The total area included in Stage 2 is 587 ft^2.

GA has decontaminated the Stage 2 area consistent with the State of California's and U.S. Nuclear Regulatory Commission's guidelines for release of facilities and equipment to unrestricted use. The results of the final radiation and contamination surveys included in this report demonstrate compliance with the guidelines.

Please note that GA has temporarily displaced personnel and equipment until such time as the "Hot Suite" areas are confirmed to meet the criteria for release to unrestricted use. Therefore, it is very important to GA to have the confirmatory surveys conducted expeditiously.

While the activities and the materials used (e.g., enriched uranium) in the "Hot Suite" area of Building 9 were licensed by the NRC, we are submitting a copy of the enclosed report to the State of California Department of Health Services and requesting their release of the subject area.

Additionally, GA is currently completing a report documenting the decontamination and final surveys of a group of laboratories located in its Building 2 (a.k.a. the L-Building). This group of laboratories consists of 11 laboratories, 3 of which have mezzanines. The total area involved in this group of laboratories is 3,638 ft^2. The report documenting GA's final surveys of these laboratories will be sent to you the week of September 11, 1989.

GA has tenants who are anxious to occupy the above mentioned laboratories as soon as permissible. It is therefore of the utmost importance to GA to obtain a confirmatory survey of these laboratories just as soon as possible.

If you should have any questions regarding our request or the enclosed report, please contact me at (619) 455-2823. As in the past, your assistance in responding to our request is very much appreciated.

Very truly yours,

Keith E. Asmussen

Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

KEA/mk
Enclosure

DECONTAMINATION OF THE "HOT SUITE" AREA OF THE TRIGA FUEL FABRICATION FACILITY FORMERLY LOCATED IN BUILDING 9 FOR RELEASE TO UNRESTRICTED USE

STAGE 2

AUGUST 31, 1989

TABLE OF CONTENTS

LIST OF ATTACHMENTS

INTRODUCTION

Until April 1975, TRIGA Fuel Fabrication activities licensed by the USNRC were conducted in two locations in General Atomics' Experimental Building (Building 9). One location was in the east side of the former "Pilot Plant" (high bay) area of the building and the other location was in the northwest corner of the building. This area in the northwest corner was then known as the "Hot Suite" area (See Attachment 2). TRIGA Fuel Fabrication activities were transferred in April 1975 to a new facility at GA (i.e. Building 22).

Decontamination of the "Hot Suite" area began in April and continued until around July 1975. The area was decontaminated for nonradioactive use but was not "officially" released by NRC to unrestricted use. Radioactive material was still being used in other areas of the building.

General Atomics (GA) has no plans for conducting future activities involving the use of radioactive materials in the Experimental Building. Accordingly, over the last two years, GA has been involved in the process of decontaminating and obtaining the release to unrestricted use of the Experimental Building (Building 9).

Beginning in October 1986, GA decontaminated the Experimental Building; except for the "Hot Suite" area. GA submitted a report dated July 28, 1987 to the NRC and to the State of California (Reference 1) requesting the release of this building to unrestricted use. This report included the former "Pilot Plant" area where a portion of TRIGA Fuel Fabrication activities were conducted but did not include the "Hot Suite" area which was occupied by GA's telecommunication group at that time.

After confirmatory surveys were completed and the building was found to meet the release criteria, the State of California released the building to unrestricted use (Amendment #87 of GA's Radioactive Materials License #0145-80, Reference 2). The NRC also released the building to unrestricted use on October 1, 1988 (Reference 3) after completion of confirmatory surveys, with the exception of the small "Hot Suite" area where certain TRIGA Fuel Fabrication activities had been located. Please note: not all portions of the area referred to here as the "Hot Suite" area involved the use of radioactive materials.

As mentioned above, GA has no plans for conducting any future activities involving radioactive materials in the "Hot Suite" area of the Experimental Building (or any other portion of the building) and would like to release the area to unrestricted use. However, since it was not feasible to move the telecommunications equipment and activities all at the same time, GA is surveying and pursuing the release of the "Hot Suite" area in three (3) stages.

The total area of the "Hot Suite" area is conservatively estimated at 4036 ft^2. Stage 1 (2880 ft^2) includes Rooms 39, 48, 49A, 50, 47A, a hallway area east and south of room 47A and the rooms which previously housed the former "Clean Machine Shop" area (these are: most of Room 38, a hallway area east of room 38, and rooms 34 and 35). Stage 2 (587 ft^2) includes rooms 40, 41, 42, 43 and 47. Stage 3 is room 49 (569 ft^2).

In late 1988 and January 1989, GA surveyed and decontaminated Stage 1 (2880 ft^2) of the "Hot Suite" area for release to unrestricted use and documented their results in a report dated January 27, 1989 and submitted to the NRC and State of California (References 4 and 5, respectively). Under a contract with NRC, Oak Ridge Associated Universities (ORAU) conducted a confirmatory survey of the Stage 1 area on March 14-23, 1989 (in conjunction with the "Group 3" laboratories of Building 2). The results of the confirmatory survey demonstrated that the Stage 1 area did indeed meet the approved criteria for release to unrestricted use. These results were documented in a report issued July 1989 (Reference 6).

In 1989, GA surveyed and decontaminated Stage 2 of the "Hot Suite" area for release to unrestricted use. This report summarizes the surveys completed for Stage 2.

The equipment (primarily telecommunications equipment) from the Stage 2 area was transferred to the Stage 1 area. The carpet installed over the original concrete floor in the Stage 2 areas was removed and the concrete below it was been surveyed for contamination. Some areas of the concrete floor were found to be slightly contaminated (up to 1200 counts per minute, primarily along the cracks on the concrete floor in each of the rooms). The only observed contaminant was uranium; U-235 enrichment varied from about three (3) percent to about ten (10) percent as determined by gamma scans of samples from the Stage 1 area. About nine (9) ft^2 of the 587 ft^2 floor area required decontamination; which represents about 2% of the Stage 2 area. The concrete was decontaminated by scraping/scabbling the surface. One small area on the west wall (adjacent to the floor) was found to be slightly contaminated (about 1000 counts per minute) and was subsequently cleaned. No contamination was detected on the any of the other walls.

GA has decontaminated the Stage 2 areas consistent with the State of California's and U. S. Nuclear Regulatory Commission's guidelines for Release of Facilities and Equipment to Unrestricted Use. The results of the final radiation and contamination surveys are included in this report to demonstrate compliance with the guidelines.

SITE DESCRIPTION

The location of the Experimental Building (Building 9) with respect to other facilities on the GA Site is shown in Attachment 1. A layout of the Building showing the "Hot Suite" area is shown in Attachment 2. The entire building, including second floors and mezzanines is almost 59,648 ft^2. Of this area, the former "Hot Suite" occupies less than 4,036 ft^2.

Attachment 3 shows the current configuration of the rooms which now occupy the former "Hot Suite" area. Attachment 4A shows the "Hot Suite" area as it existed when TRIGA Fuel Fabrication activities were conducted there. Attachment 4 is a view graph of this drawing which can be overlaid on the drawing showing the current configuration (Attachment 3). A comparison of the two drawings reveals that some of the original walls of the "Hot Suite" area were removed during the reconstruction of the area and new walls were installed. Because of these differences, the area (ft^2) is conservatively estimated to ensure that all previous "Hot Suite" areas are included in the final release surveys.

The former "Hot Suite" area contained a "Hydride Room" (currently Rooms 39 and 50), a "Hot Machine" shop (currently Rooms 49A, 49, 40, 47 and portions of 47A, 41, 42 and 43), a "Hot Furnace" or "Melt Room" (currently Room 48), a "Change Room" (currently a portion of room 47A and a portion of the hallway east and south of room 47A) and a "Clean Machine Shop" (most of room 38, a portion of the hallway east of room 38, and rooms 34 and 35).

The total area of the "Hot Suite" (4,036 ft^2) is being released in three stages. Attachment 5 shows the various rooms involved in each of the three (3) decontamination stages.

Stage 1 (2,880 ft^2) includes Rooms 39, 48, 49A, 50, 47A, a hallway east and south of room 47A, and the rooms which previously housed the "Clean Machine shop" (most of room 38, the hallway east of room 38 and rooms 34 and 35). **Stage 1 has been released to unrestricted use.** Stage 2 (587 ft^2) includes rooms 40, 41, 42, 43 and 47. Stage 3 is room 49 (569 ft^2).

Note: GA has recently changed the room numbers in the Stage 2 area. Rooms 40, 41, 42, 43 and 47 are now referred to as rooms 40 and 41 since there are no walls between the other rooms. However, to be consistent with the previous reports (References [illegible] and 5), the "old" rooms numbers are used in this report. New room numbers are provided to preclude any confusion in the future.

The approximate area in ft^2 for each room to be released to unrestricted use is provided below as well as the "stage" it is in.

Room	Approximate area (ft^2)
Stage 1	
Room 39	246
Room 48	528
Room 49A	456
Room 50	174
Room 47A	137
Hallway (east and south of room 47A)	330
Former "Clean Machine Shop" Area	
Room 38	182
Room 34	286
Room 35	370
Hallway area east of room 38	171
Total Stage 1	2,880
Stage 2	
Room 40	106
Room 41	81
Room 42	94
Room 43	94
Room 47	212
Total Stage 2	587
Stage 3	
Room 49	569
Total Stage 3	569
TOTAL (All Stages)	4,036

The surveys in this report are limited to the rooms identified as Stage 2.

HISTORICAL OVERVIEW OF PROCESSING ACTIVITIES

The Hot Suite's existence began in 1958 primarily for the research, development, and manufacturing of TRIGA fuel elements in accordance with NRC (previously AEC) licenses SNM-69 and SNM-696. This work involved primarily the use of 20% enriched uranium (U-235). A review of past Work Authorizations revealed that it was also used for small test runs of prototype and non-TRIGA reactor fuel using mostly depleted uranium. In addition, a large batch of fuel was fabricated for the Massachusetts Institute of Technology using "normal" uranium.

A new TRIGA Fuel Fabrication Facility was subsequently constructed at General Atomics, and in April 1975, transfer of usable equipment from the "Hot Suite" to the new building began. In May 1975, contaminated components were removed from the Hot Suite and disposed of as contaminated waste and facility decontamination efforts began. The building was then decontaminated to very low levels; less than 500 counts per minute alpha fixed contamination (measurements were made on a grid with a portable alpha counter) and less than 20 dpm/100 cm^2 removable contamination (Reference 8).

TARGET CRITERIA FOR UNRESTRICTED RELEASE

The following approved target criteria have been taken from Reference 7. Table 1 (Attachments 6A and 6B) is taken from USNRC's and State of California's (respectively) criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into our SNM-696 and State of California licenses. The limits in this table were used for releasing concrete and other surfaces at the facility to unrestricted use.

RADIATION DETECTION EQUIPMENT

The following radiation detection equipment was used for the various surveys.

1. Beta/gamma counters
   a. Model TBM 28 and Model TBM 15 geiger counters manufactured by Technical Associates were used to survey surfaces for beta/gamma contamination. The instruments contain a pancake geiger mueller (GM) detector which has a window thickness of less than 7 mg/cm^2. The instrument has three ranges covering from 0-50,000 counts per minute (cpm).

2. Alpha counters
   a. Model 12 rate meters with Model 43-44 air proportional alpha probes manufactured by Ludlum Measurements Inc. were used to survey equipment and surfaces for alpha contamination. The instrument has four ranges covering from 0-500,000 counts per minute.
   b. Model 12 rate meters with Model 43-1 scintillation alpha probes manufactured by Ludlum Measurements Inc. were used to survey equipment and surfaces for alpha contamination. The instrument has four ranges covering from 0-500,000 counts per minute.

3. Gamma Detectors
   a. Model 19 microR meters (containing a NaI scintillation detector) manufactured Ludlum Measurements Inc. were used to survey the rooms.

   b. Gamma spectral analysis on selected samples of concrete and soil samples from the Stage 1 areas were done using a high purity germanium detector manufactured by Canberra Industries, Inc.

4. Wipe Analysis

   Wipe samples collected throughout the Stage 2 rooms after clean up operations were counted using a Model 2404 low-level alpha beta gamma counting system manufactured by Canberra Industries, Inc.

All portable instruments are calibrated semiannually using a nominal 30 curie Cs-137 source except the Ludlum Model 19 which is calibrated by the manufacturer. The alpha/beta system has been calibrated for the various types of samples. This calibration is checked on a daily or weekly basis depending on usage.

The final survey results have been converted from cpm (counts per minute) for a particular detector to dpm/100cm^2 by correcting the counts per minute observed by appropriate detector readings for background, detector efficiency and geometric factors associated with the instrumentation.

1. Background

   A "standard" natural background was determined for each type of detector and subtracted from the survey readings.

2. Efficiency

   Portable beta/gamma (GM) and alpha counters were calibrated to determine their efficiencies for uranium after analyses of samples of contaminated concrete from the Stage 1 areas showed uranium contamination (the U-235 enrichment varied from 3-10%).

   In order to simulate the conditions on the concrete surfaces, concrete blocks having an area of approximately 25 cm x 25 cm previously spiked with NBS traceable standard liquid solutions of depleted uranium and 93 percent enriched uranium to the average allowable release levels listed in Table 1. The average allowable level for an area one meter by one meter or less is 5000 dpm/100 cm^2 and the maximum allowable level is 15,000 dpm for an area less than 100 cm^2 (Attachments 6A and 6B). Surface measurements of the blocks were obtained with the instruments to determine the average allowable cpm. Since the blocks were for depleted uranium and 93% enrichments, and the enrichment varied from 3-10%, the strictest limits of these two (the 93% enrichment standard) was used for determining the allowable limits. Percent efficiencies were obtained to convert the readings in counts per minute (cpm) to disintegrations per minute (dpm).

3. Geometry Correction
The values listed in Table 1 (Attachments 6A and 6B) are in dpm/100 cm^2, therefore, a correction factor was applied to the values to correct for the smaller area of the detector. The TBM-28 and TBM-15's have 5 cm diameter detectors which measures a 19.6 cm^2 area. The reading is corrected by multiplying by 5.1. The alpha detectors used for the surveys "see", at any given time, an area of about 78.7 cm^2, which then requires a correction factor of 1.27.

INITIAL SURVEY AND DECONTAMINATION EFFORTS

All the equipment (primarily telecommunications equipment) from the Stage 2 area was transferred to a temporary location. The carpet installed over the original concrete floor was removed.

An initial survey (Attachment 7) was conducted in the area to determine if there was any detectable contamination. Radiation measurements using a geiger counter showed contamination primarily along the cracks on the concrete and along the northwest side of the floor of room 40. A beta/gamma contamination survey on the surface of the concrete floor was conducted (measurements were made with Model TBM-28 and Model TBM-15 geiger counters). Low beta/gamma levels were detected i.e. up to 1200 counts per minute (cpm) on several small floor areas in the Stage 2 rooms.

The walls (north, south and west) were surveyed up to two (2) meters above the floor (the east wall is a new wall and was not part of the "Hot Suite" area). A small localized area along the west wall of room 40 (adjacent to the floor) was contaminated (~1000 cpm beta/gamma). No other contamination was detected on the walls.

The Stage 2 "Hot Suite" area has been conservatively estimated to be about 587 ft^2. About nine (9) ft^2 of the 587 ft^2 required decontamination; which represents < 2 % of the Stage 2 area. The floor area decontaminated in each room is provided in the table below:

Room	Approximate Area (ft^2)	Approximate Total Area (ft^2) Decontaminated
Stage 2		
Room 40	106	~2.0
Room 41	81	~5.3
Room 42	94	0
Room 43	94	~0.1
Room 47	212	~1.3
Total Stage 2	587	~8.7

FINAL RADIATION SURVEYS

Table 1 (Attachments 6A and 6B) provides acceptable (approved) limits for fixed contamination levels. Final radiation surveys of the Stage 1 rooms which were cleaned and/or scabbled were conducted. The measurements of average contamination (in dpm/100 cm^2) were averaged over 1 M^2 area or less. The maximum contamination level (also in dpm/100 cm^2) applies to an area of not more than 100 cm^2. The final floor survey is provided in Attachment 8. The final wall surveys are provided in Attachment 9.

A microR meter was also used to survey the rooms and to measure radiation levels. The final surveys show the measurements obtained on the surface at several locations. These levels were all within normal background levels. The results of this survey are provided in Attachment 10.

Alpha counters were also used to survey the rooms. Very low i.e. < 60 cpm (if any) levels of alpha contamination were detected. The beta/gamma levels were used to determine allowable release levels for the uranium contaminated areas.

FINAL CONTAMINATION SURVEYS

Table 1 (Attachments 6A and 6B) provides limits for acceptable removable surface contamination levels. Wipes were collected on the floors of the rooms. The wipe sample locations are shown in Attachments 9 and 10 (floor and wall, respectively). The results are provided in Attachment 11. The contamination levels in every location were < 20 dpm/100 cm^2 area, and well below the Table 1 limits (Attachment 6A and 6B) for removable contamination.

COMPLIANCE WITH THE TARGET CRITERIA

Facilities and Equipment

Concrete and other surfaces of the Stage 2 rooms were cleaned to levels below the limits in Table 1. The final surveys provided in this report demonstrate compliance.

Direct Radiation

The direct radiation levels in all areas of the Stage 2 areas are at or below normal background levels.

CONCLUSION

Stage 2 rooms of the former TRIGA Fuel Fabrication "Hot Suite" area formerly located in the northwest corner of the Experimental Building (Building 9) have been decontaminated to levels below the specified limits and therefore meet the criteria for release to unrestricted use.

REFERENCES

1. Asmussen, Keith E., letter #CAL-1095 to Mr. Ben Kapel, "Final Survey Report on the Decontamination of GA Technologies' Experimental Building", dated July 28, 1987.

2. Kapel, Ben R., letter to Keith E. Asmussen dated May 14, 1987. Docket #033087-0145, containing amendment #86 to GA's radioactive material license number 0145-80.

3. Montgomery, James L., letter dated October 1, 1987 to R. N. Rademacher, "Inspection at GA Technologies, Inc. (Confirmatory Survey), with Report No. 70-734/87-11.

4. Asmussen, Keith E., letter #696-1337 to Mr. Robert D. Thomas, "Request for Confirmatory Survey (Experimental Building - Stage I", dated January 30, 1989.

5. Asmussen, Keith E., letter #CAL-1340 to Mr. Gerard Wong, "Request for Release of Certain Portion of GA's Experimental Building (Stage I)", dated January 30, 1989.

6. Yuhas, Gregory P., letter dated August 18, 1989 to R. N. Rademacher, "NRC Inspection" with ORAU final report 89/F-98 dated July 1989.

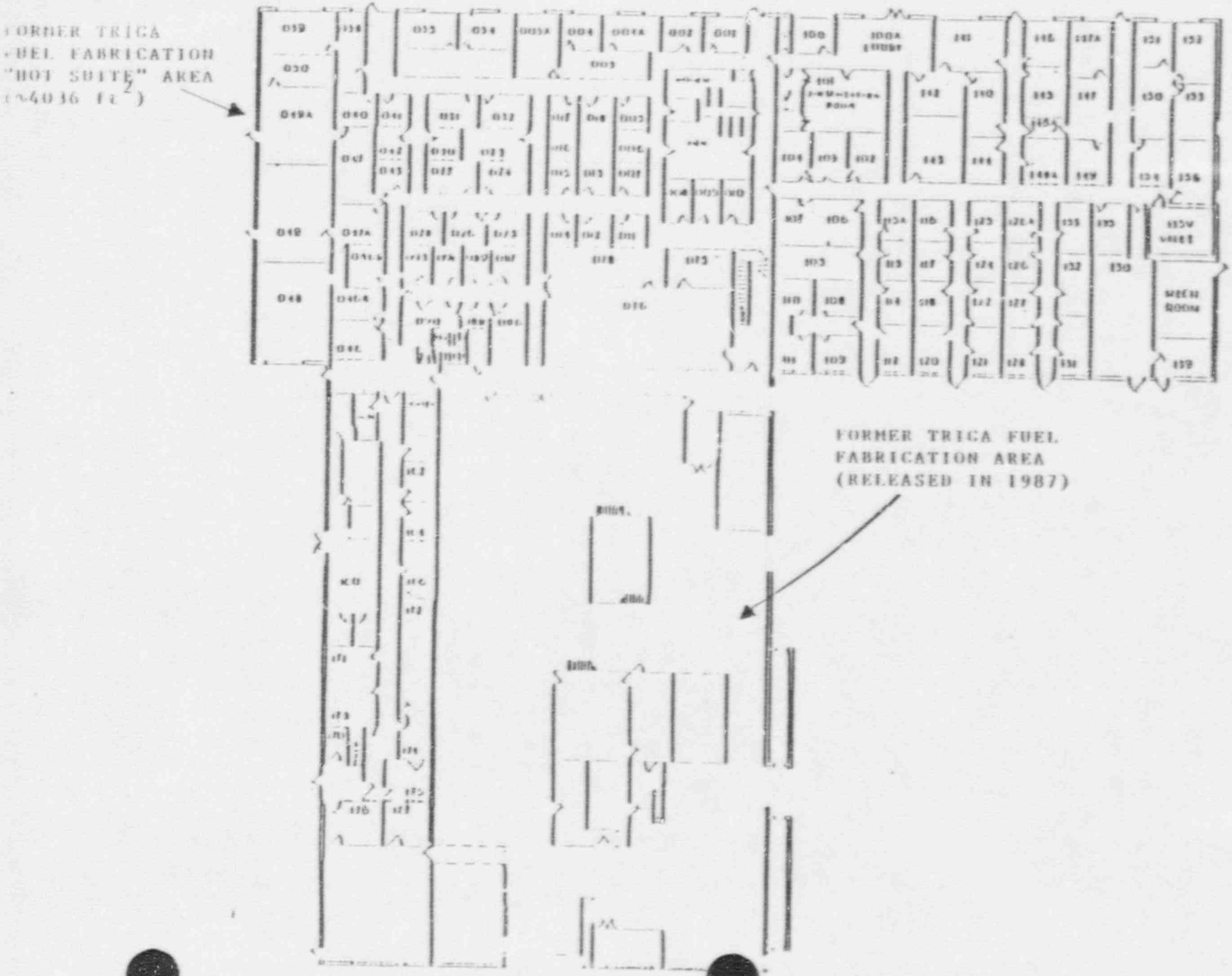
7. Asmussen, Keith E., letter #CAL-1049 to Mr. Ben Kapel, "Decontamination of GA Technologies' Experimental Building," dated March 27, 1987.

8. Letter dated 8/5/75, J. M. Keith to F. O. Bold.

NO.	FACILITY
1	ADMINISTRATION
2	LABORATORY
9	EXPERIMENTAL
11	SERVICE AND RECEPTION CENTER
,14,15	T.D. COMPLEX
21	TRIGA REACTORS
22	TRIGA FUEL FAB
23	HOT CELLS
25	WASTE PROCESSING—MS
27	EA—1
30	LINAC
31	ECF
34	DOUBLET III
35	TEST TOWER
37	SV—A (FUEL MANUFACTURING)
39	SV—B
41	WASTE PROCESSING—SV

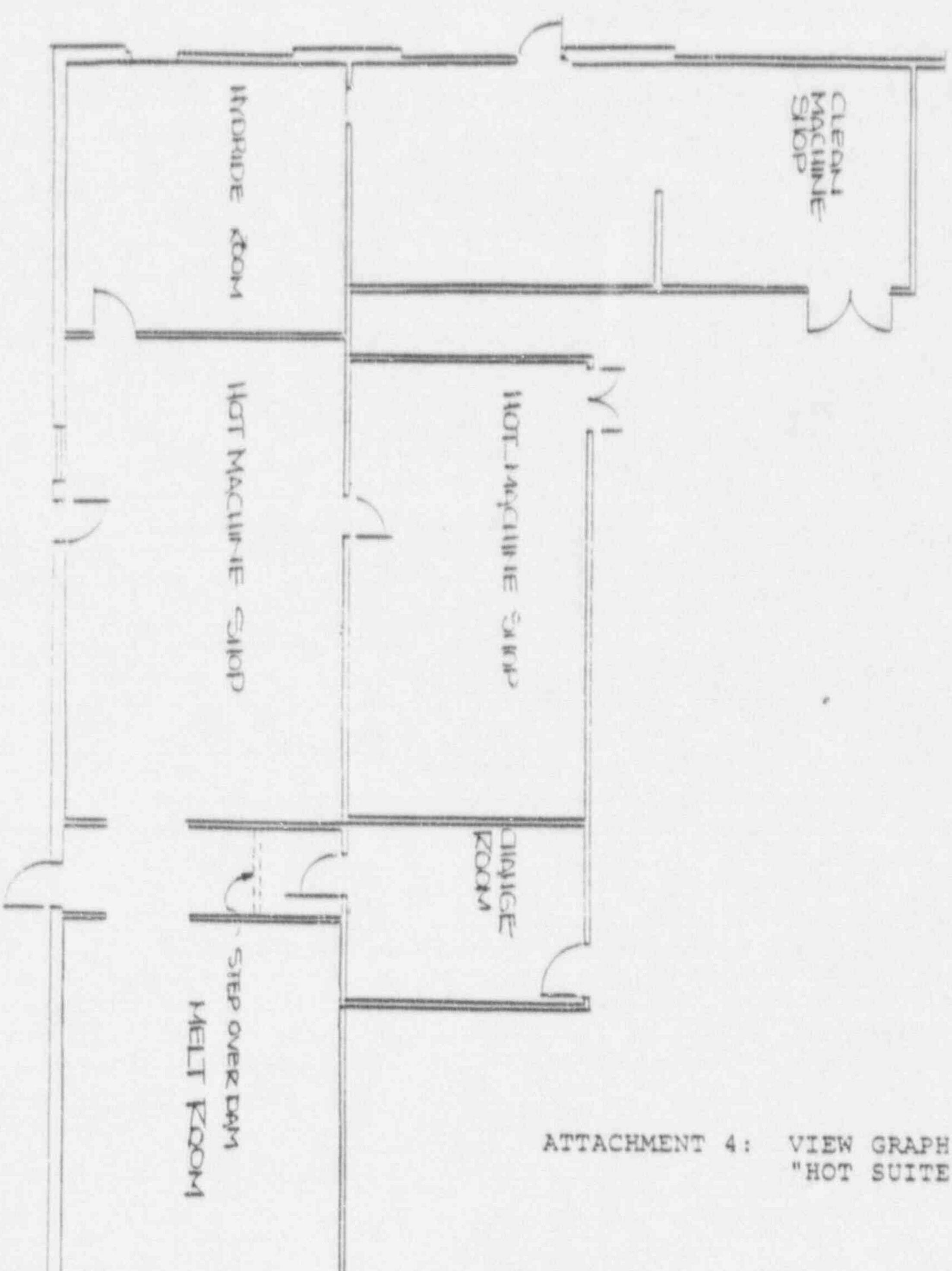
6/88

ATTACHMENT 1: Plan View of Sites



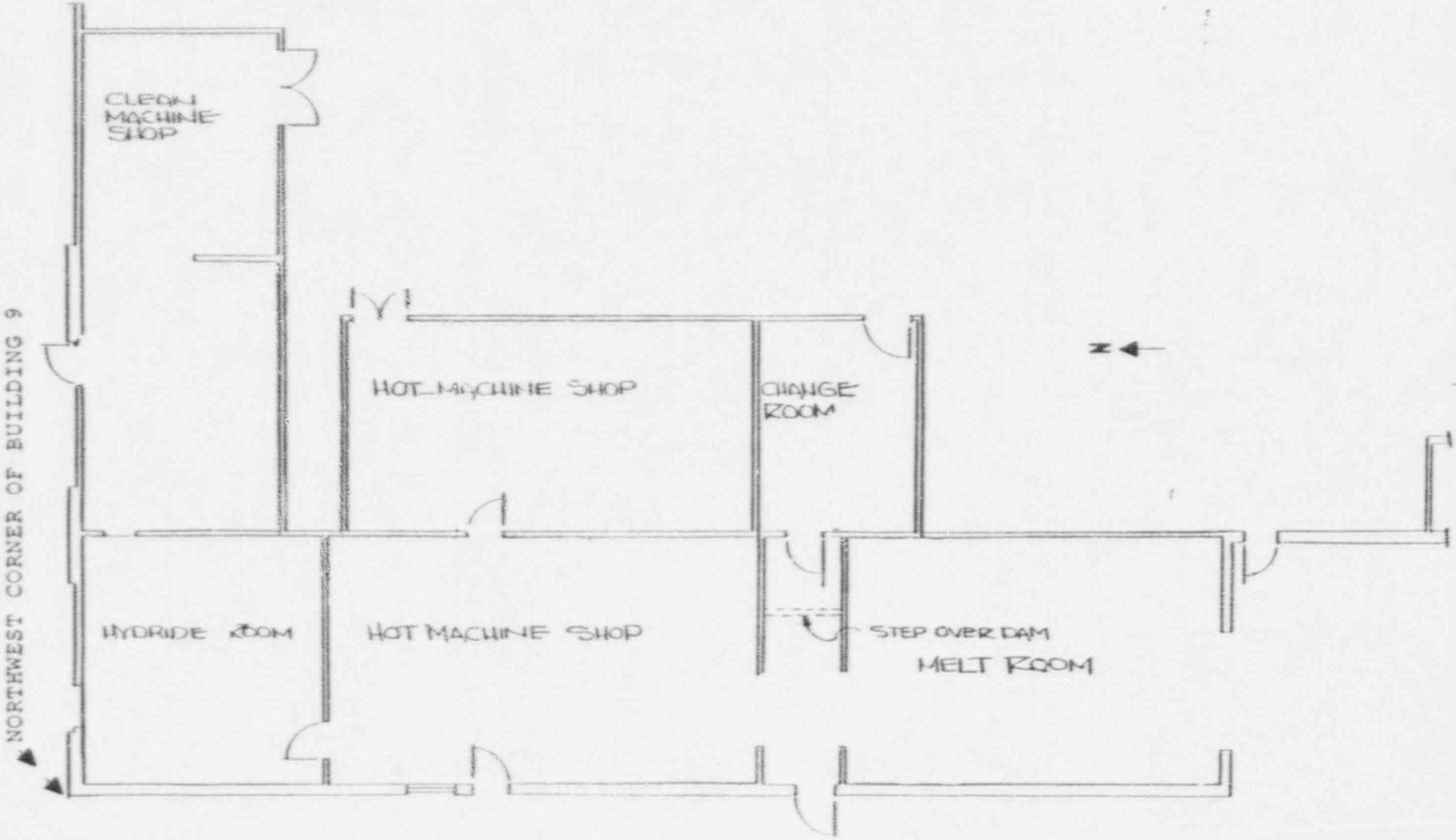
AT MENT 2: FIRST FLOOR OF THE EXPERIMENTA ILDING SHOWING THE PREVIOUS LOCATION OF THE "HOT SUITE" AREA

ATTACHMENT 3: CURRENT CONFIGURATION OF FORMER "HOT SUITE" AREA

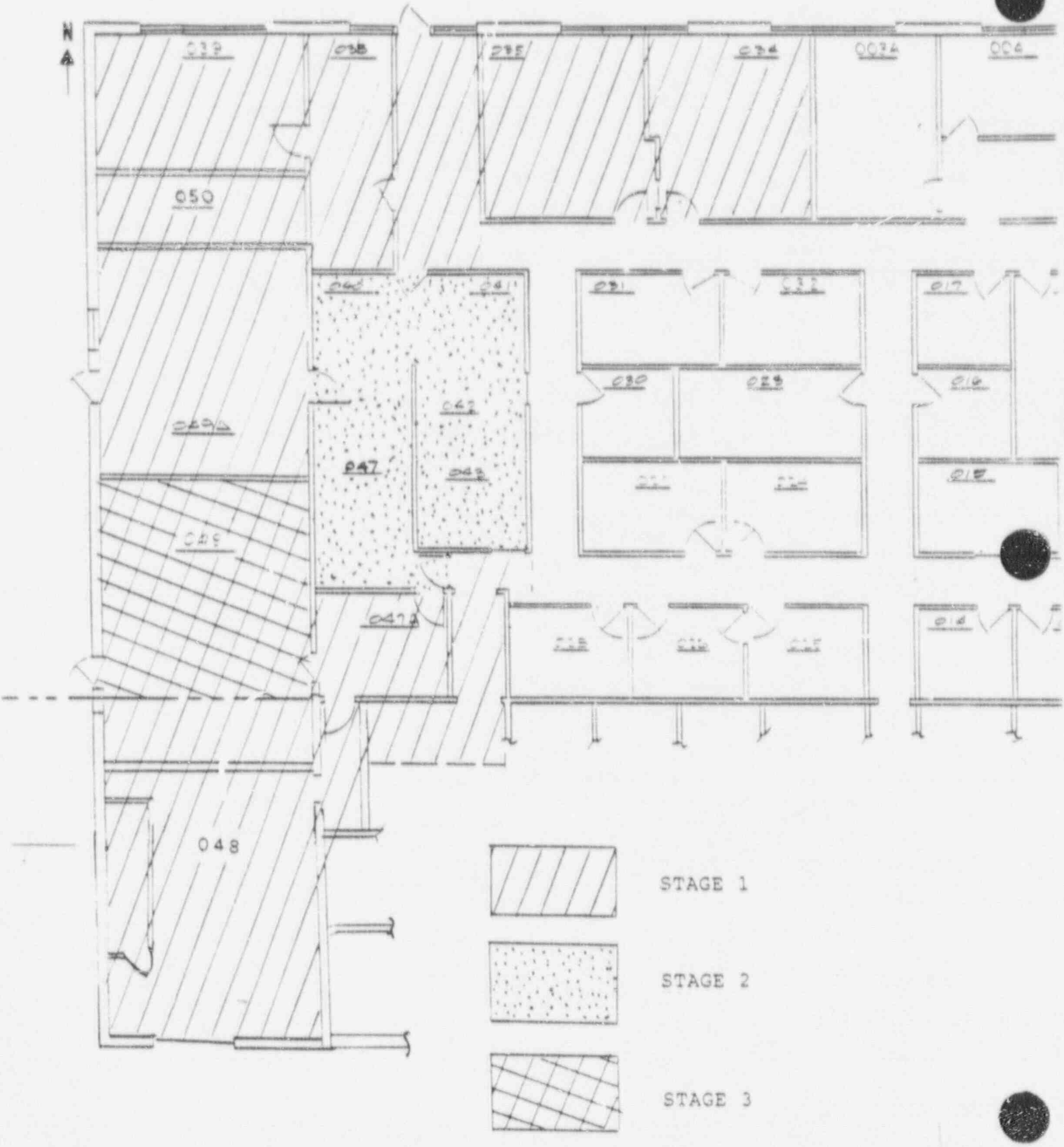


ATTACHMENT 4: VIEW GRAPH SHOWING "HOT SUITE" AREA

ATTACHMENT 4A: FORMER "HOT SUITE" AREA OF BUILDING 9



ATTACHMENT 5: DECONTAMINATION STAGES FOR THE "HOT SUITE" AREA



ATTACHMENT 6A

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES[a]	AVERAGE[b c f]	MAXIMUM[b d f]	REMOVABLE[b e f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126 I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

ATTACHMENT 6B

TABLE I

ACCEPTABLE SURFACE CONTAMINATION LEVELS 1/ 2/

NUCLIDE[a]	AVERAGE[b,c] (dpm/100 cm^2)	MAXIMUM[b,d] (dpm/100 cm^2)	REMOVABLE[b,e] (dpm/100 cm^2)
) U-nat, U-235, U-238, and associated decay products	5,000	15,000	1,000
) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231 Ac-227, I-125, I-129	100	300	20
) Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
) H-3, C-14 except as DNA precursors f/	20,000	60,000	4,000

here surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the lim[illegible] stablished for alpha- and beta-gamma-emitting nuclides should apply independently.

s used in this table, dpm (disintegrations per minute) means the rate of emission by radioactiv aterial as determined by correcting the counts per minute observed by an appropriate detector or background, efficiency, and geometric factors associated with the instrumentation.

easurements of average contaminant should not be averaged over more than 1 square meter. For bjects of less surface area, the average should be derived for each such object.

he maximum contamination level applies to an area of not more than 100 cm^2.

he amount of removable radioactive material per 100 cm^2 of surface area should be determined y wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and ssessing the amount of radioactive material on the wipe with an appropriate instrument of known fficiency. When removable contamination on objects of less surface area is determined, the ertinent levels should be reduced proportionally and the entire surface should be wiped.

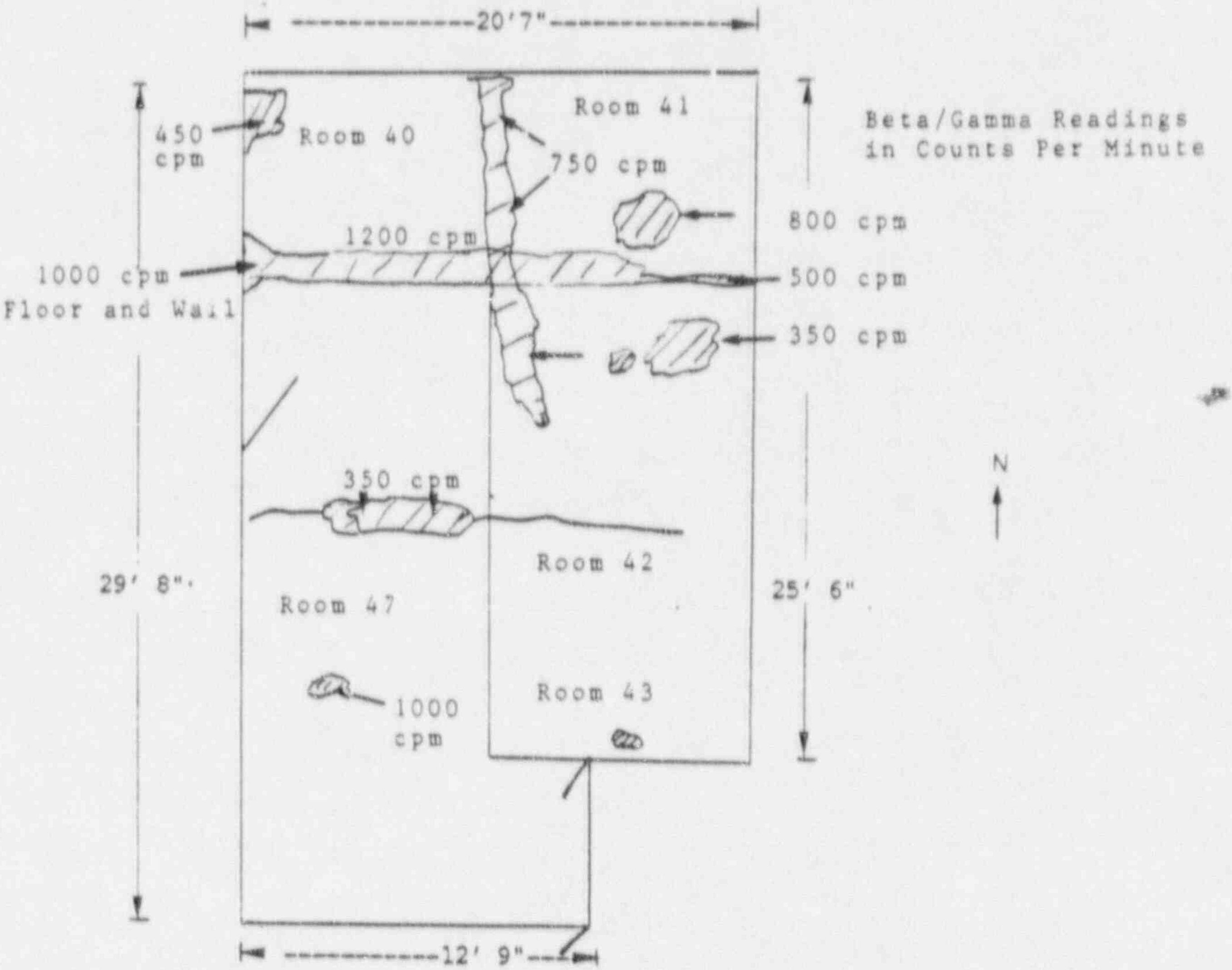
NA precursors mean molecules or compounds that are directly incorporated into the DNA molecule uring DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and ucleosides. The acceptable surface contamination levels for H-3 and C-14 in DNA precursors re as tabulated in paragraph (d) for beta-gamma-emitters.

USNRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, Wash[illegible]n D.C. (June 1974)

ANSI, Control of Radioactive Surface Contamination on Materials, Equipment and Facilities To Be Released for Uncontrolled Use, final draft, proposed American National Standard N-328, Atomic Industrial Forum, Inc., N.Y. (June 1974)

ATTACHMENT 7

INITIAL SURVEY OF THE "HOT SUITE" STAGE 2 FLOOR AREAS

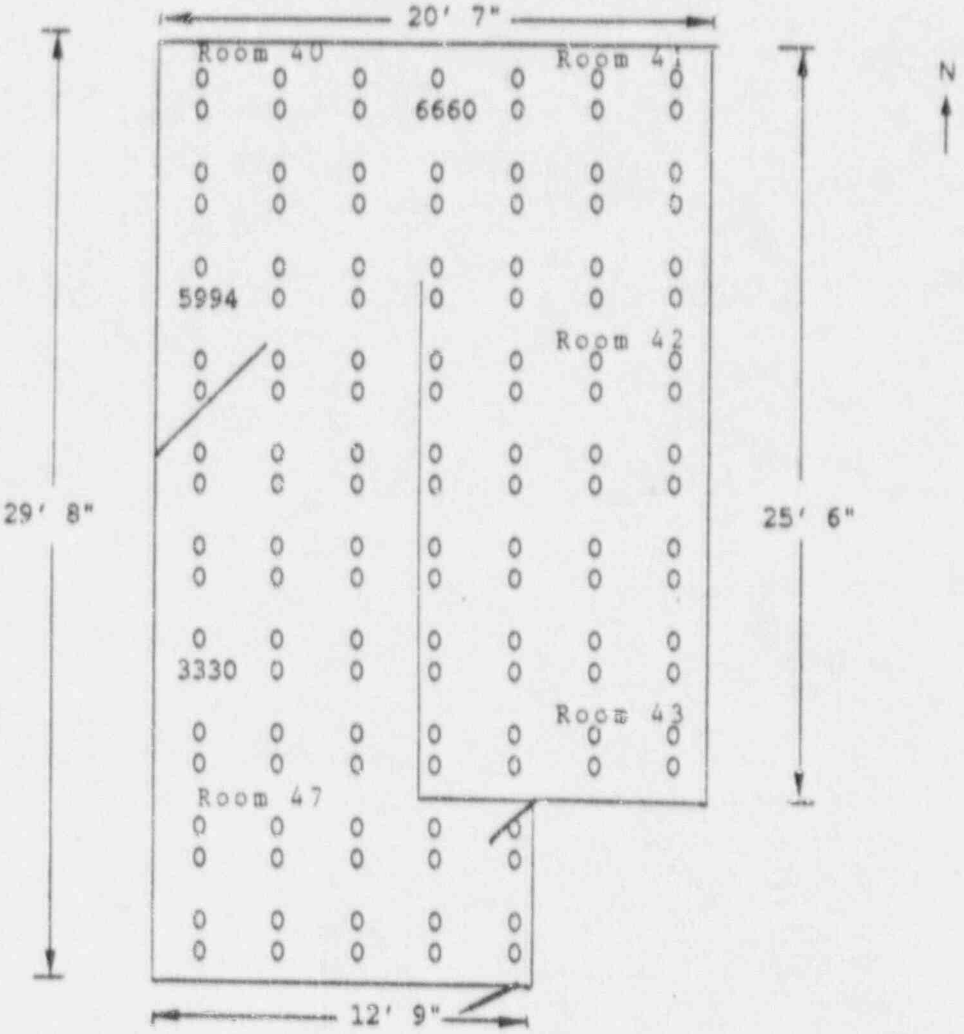


Notes:

1. Initial survey completed on the concrete floor after removal of the carpet. Survey completed on May 23, 1989 using a Model TBM-28 geiger counter (#92238) calibrated February 9, 1989, and on August 22-23 using Model TBM-28 geiger counter (#2759) calibrated 8/14/89.
2. MicroR meter measurements using a Model Ludlum 19 survey meter (#34915) calibrated February 8, 1989 were all 10 microR/hour except for a small spot in room 41 which measured ~ 15 microR/hour.
3. Alpha surface measurements using a Ludlum 12 ratemeter (#46452) with an alpha probe (model #43-1) calibrated January 20, 1989.
4. Contamination was detected primarily along the cracks in rooms 40 and 41. Contamination was also detected along the west floor area of room 40 (~1000 cpm). Small "spots" reading ~350-1000 cpm (beta/gamma) were found in the rooms.
5. The concrete was scabbled along the cracks and "spots" until levels were below allowable release levels.

ATTACHMENT 8

FINAL SURVEY OF THE "HOT SUITE" STAGE 2 FLOOR AREAS



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0	0	0	6660	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
5994	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
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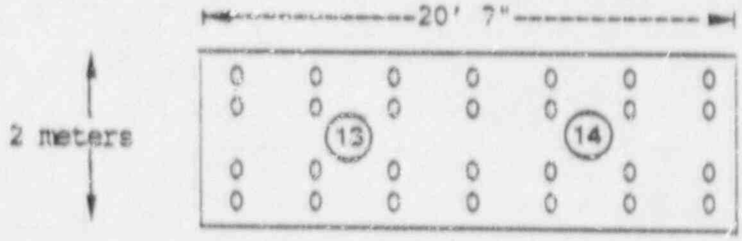
0	0	0	0	0	0	0
0	0	0	0	0	0	0
3330	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0		
0	0	0	0	0		
0	0	0	0	0		
0	0	0	0	0		

Notes:

1. Levels were measured on concrete floor after cleaning or scabbling.
2. Final survey completed August 22-23, 1989 using TBM-28 geiger counter (# 2759) calibrated August 14, 1989, and on August 24, 1989 using Model TBM-15 (#108113) calibrated May 2, 1989)
3. Each unit represents a three foot by three foot area or less.
4. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
5. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.

ATTACHMENT 9
SURVEYS OF THE "HOT SUITE" STAGE 2 ROOM WALLS

INITIAL AND FINAL SURVEY OF THE NORTH WALL



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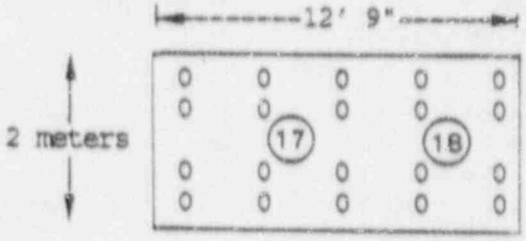
0	0	0	0	0	0	0

INITIAL AND FINAL SURVEY OF THE SOUTH WALL



0	0	0	0	0
0	0	0	0	0
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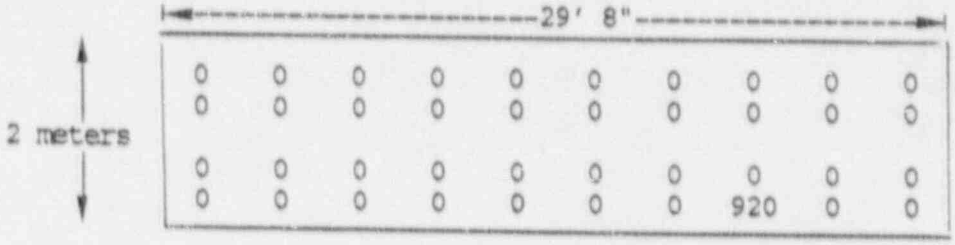
0	0	0	0	0

○ Contamination Survey Locations (See Attachment 11 for Results)

INITIAL SURVEY OF THE WEST WALL (completed 8/23/89 using TBM-2759)



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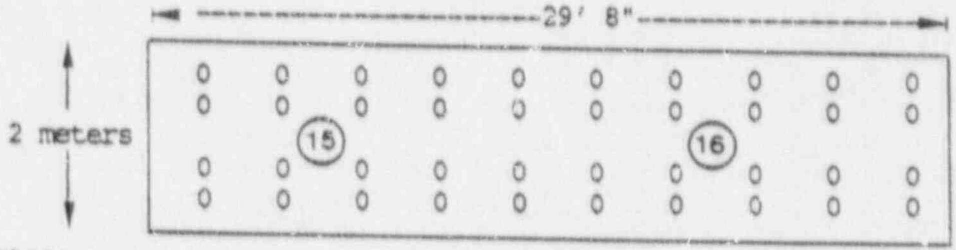
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	920	0	0

FINAL SURVEY OF THE WEST WALL



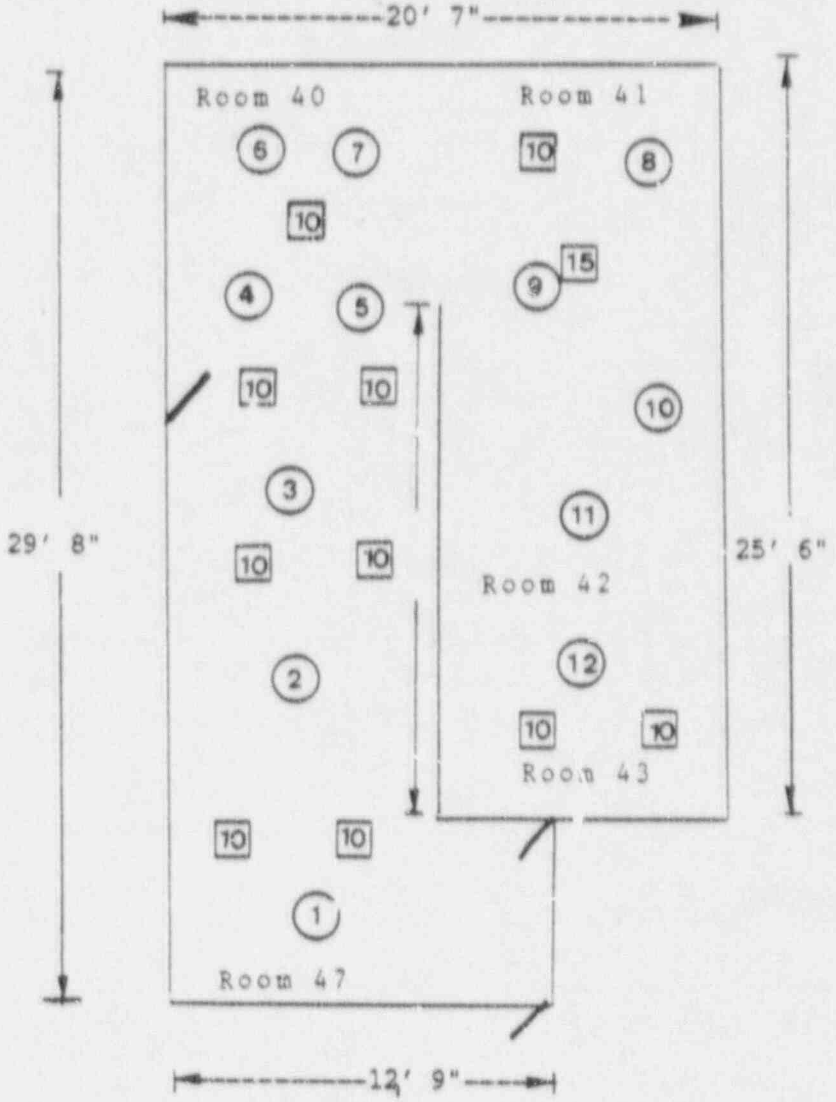
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

Notes:

1. Levels were measured on concrete floor after cleaning or scabbling.
2. [Inital survey of the west wall shows levels in counts per minute (background subtracted)]. Final surveys completed August 22-23, 1989 using TBM-28 geiger counter (# 2759) calibrated August 14, 1989, and on August 24, 1989 using Model TBM-15 (#108113) calibrated May 2, 1989)
3. Each unit represents a three foot by three foot area or less
4. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less. (Final surveys)
5. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2. (Final surveys)

ATTACHMENT 10

CONTAMINATION SURVEY LOCATIONS AND MICRO R/HR RADIATION LEVELS ON STAGE 2 FLOOR AREAS



Notes:

1. Circled numbers are wipe locations.
2. Numbers in squares are microR/hour surface radiation levels.

AUG 2 4 1989

ATTACHMENT 11 CONTAMINATION SURVEY RESULTS

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
07W-1 Room 47	1.	6.322E-01	149.83	<9.111E-01	95.00
2 40-47 Room 47	1.	<1.089E-02	95.00	<3.248E-02	95.00
3 8/23/89 Room 47	1.	<1.089E-02	95.00	<3.693E-01	95.00
4 Room 40	1.	2.905E-01	230.60	<1.402E 00	95.00
5 Room 40	1.	2.905E-01	230.60	<9.111E-01	95.00
6 Room 40	1.	<1.089E-02	95.00	<3.693E-01	95.00
7 Room 40	1.	2.905E-01	230.60	<3.693E-01	95.00
8 Room 41	1.	2.905E-01	230.60	<3.248E-02	95.00
9 Room 41	1.	2.905E-01	230.60	<3.693E-01	95.00
10 Room 42	1.	6.322E-01	149.83	<1.402E 00	95.00
11 Room 42	1.	<1.089E-02	95.00	<3.248E-02	95.00
12 Room 42	1.	2.905E-01	230.60	<3.693E-01	95.00
13 North Wall	1.	2.905E-01	230.60	<9.111E-01	95.00
14 North Wall	1.	<1.089E-02	95.00	<3.693E-01	95.00
15 West Wall	1.	<1.089E-02	95.00	<3.693E 01	95.00
16 West Wall	1.	<1.089E-02	95.00	<9.111E-01	95.00
17 South Wall	1.	<1.089E-02	95.00	<1.402E 00	95.00
18 South Wall	1.	<1.089E-02	95.00	<9.111E-01	95.00
AVERAGE		1.886E-01		6.358E-01	
HIGH		6.322E-01		1.402E 00	
LOW		1.089E-02		3.248E-02	

STAGE 2 AREAS

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

NOTE:
SEE ATTACHMENTS 9 and 10 FOR LOCATIONS

GENERAL ATOMICS

September 13, 1989
696-1447

Mr. R. F. Fish
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Subject: Docket No. 70-734: SNM-696; Request for Confirmatory Survey (Selected Laboratories in Building 2 - Group 4)

Reference: Asmussen, Keith E., letter No. 696-1443 to R. F. Fish, "Request for Confirmatory Survey (Experimental Building - Stage 2)," dated August 31, 1989

Dear Mr. Fish:

General Atomics (GA) recently submitted a report documenting the results of its final radiation and contamination surveys of the "Stage 2" area of GA's Building 9 and requested a confirmatory survey of this area (see referenced letter). In the referenced letter, it was mentioned that GA also had a group of laboratories and associated offices for which a report documenting their final surveys was nearly complete, and that this report would be submitted to you the week of September 11, 1989. That report is enclosed. It addresses a group of 11 laboratories (3 with mezzanines) in GA's Building 2 (also known as the L Building). This group of laboratories totals about 3,749 ft^2 and is referred to as Group 4 (confirmatory surveys were previously conducted on three other groups of laboratories in Building 2).

The results of the final radiation and contamination surveys documented in the enclosed report demonstrate compliance with the State of California's and U.S. Nuclear Regulatory Commission's guidelines for release of facilities and equipment to unrestricted use. The primary radionuclides previously used in these laboratories were depleted, natural and enriched uranium, thorium, tritium and other fission products. Most of the laboratories required no decontamination beyond the removal/decontamination of sources and contaminated equipment.

The only exceptions were five small areas/spots (~1 ft^2) which were found to be contaminated. One was found in laboratory 556 where the contaminant was uranium-235, and the other four were found in the combined laboratories 359/361 where the contaminant was thorium.

This report is being provided for your use in planning for a confirmatory survey and in support of the subsequent release of the subject facilities to unrestricted use. We are submitting a copy of the enclosed report to the State of California Department of Health Services and requesting that they coordinate with your office any surveys they may wish to conduct.

Again, please note that GA has displaced personnel and equipment and has tenants waiting to occupy laboratory space pending the completion of the requested confirmatory surveys. It is therefore of great importance to GA that the surveys be conducted as soon as possible.

If you should have any questions regarding our request or the enclosed report, or if there is anything GA can do to help expedite the scheduling of the confirmatory surveys, please contact me at (619) 455-2823.

Very truly yours,

Keith E. Asmussen

Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

Enclosure (3 copies)

cc: Ms. Mary Horn, NRC Headquarters

DECONTAMINATION OF SELECTED GENERAL ATOMICS' SCIENCE LABORATORIES FOR RELEASE TO UNRESTRICTED USE

(Group 4)

SEPTEMBER 12, 1989

TABLE OF CONTENTS

LIST OF ATTACHMENTS

INTRODUCTION

General Atomics has been involved in the process of decontaminating and obtaining the release to unrestricted use of selected laboratories and associated offices in GA's Building 2 (also known as the Science Laboratories Building or "L" Building). Thirty-eight (38) such laboratories were released in 1988 in two groups designated as "Group 1" and "Group 2". Group 1 involved the release of twenty-five (25) laboratories and Group 2 involved the release of thirteen (13) laboratories. In December 1988, GA requested the release of another group of labs and associated offices designated as "Group 3". This group consists of seventeen (17) laboratories; including laboratory 315 and rooms 1 and 2 of laboratory 309 which were added as an addendum to the Group 3 final report. Twelve (12) of these laboratories had mezzanines and nine (9) other mezzanines were located above laboratories which were not requested to be released. These later laboratories are currently occupied, however, none of the activities in these laboratories involve the use of radioactive material. Group 3 laboratories were released to unrestricted use in 1989.

GA has recently decontaminated another group of laboratories in Building 2. GA has no plans for conducting any future activities involving radioactive materials in these laboratories and/or mezzanines designated as "Group 4". The offices across the hall from these laboratories have never been used for work involving radioactive materials. Accordingly, GA is requesting a confirmatory survey of these laboratories and mezzanines and their associated offices in support of their release to unrestricted use.

The 11 laboratories (3 have mezzanines) in "Group 4" consist of a total area of about 3749 ft^2 to be released to unrestricted use. A brief history of the use of these laboratories is provided.

The primary radionuclides previously used in these laboratories were depleted, natural and enriched uranium, thorium, tritium and other fission products. Most of the laboratories did not require decontamination beyond the removal/decontamination of sources and contaminated equipment (including glove boxes, hoods, filter plenums and associated ducting). Five (5) small areas of contamination were identified in these labs; two areas on the floor and two areas on the southeast wall of combined labs 359/361 and one small, i.e. less than 100 cm^2, area on the floor in laboratory 556. Each of these areas were decontaminated to levels well below the release criteria.

GA has decontaminated equipment and facilities consistent with the State of California's and U. S. Nuclear Regulatory Commission's guidelines for Release of Facilities and Equipment to Unrestricted Use. The results of the final radiation and contamination surveys are included in this report to demonstrate compliance with the guidelines.

SITE DESCRIPTION

The location of Building 2 with respect to other facilities on the GA Site is shown in Attachment 1. A layout of Building 2 is shown in Attachment 2. The building is divided into three Laboratory sections; Laboratory B, C, and A. Laboratory B includes offices and laboratories from 102 through 243. Laboratory C includes offices and laboratories from 300 through 445 and Laboratory A includes offices and laboratories from 502 through 651 The laboratories and mezzanines in the Group 4 laboratories to be released to unrestricted use are located in two of the laboratory sections (Sections C and A) as shown in Attachment 3.

Group 4 laboratories consist of a total of eleven (11) laboratories (3 with mezzanines). These labs and mezzanines are: Lab 317 (and the mezzanine above the lab), combined lab 355/357 (no mezzanine), combined lab 359/361 (with a mezzanine above the labs), combined lab 554/556/558/560 (no mezzanine), and combined lab 562/564 (no mezzanine). The approximate area in ft^2 is presented below:

Laboratory/Mezzanine	Approximate ft^2
Lab 317	288
Mezzanine above Lab 317	112

Labs 355/357 (Combined Lab)	576
Labs 359/361 (Combined Labs)	576
Mezzanines above Labs 359/361	385
Labs 554/556/558/560 (Combined Lab without a mezzanine)	1152
Labs 562/564 (Combined lab without a mezzanine)	660
TOTALS	3749

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Table I (Attachment 4A) is taken from USNRC's criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into our SNM-696 license. The State of California's limits for release of facilities and equipment to unrestricted use are identical to these limits for the radionuclides of concern (predominantly U-238, Cs-137, U-235 and Co-60). These guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," are also known as "DECON-1" are summarized in Table I (Attachment 4B). GA has decontaminated the laboratories and mezzanines to levels below these guidelines.

INSTRUMENTATION AND MEASUREMENT LIMITS FOR RELEASE

Instrumentation

1. Beta/gamma counters - Model TBM-28 and Model TBM-15 geiger counters manufactured by Technical Associates were used to survey surfaces for beta/gamma contamination. The instruments contain a pancake Geiger-Mueller (GM) detector which has a window thickness of less than 7 mg/cm^2. The instrument has three ranges covering from 0-50,000 counts per minute (cpm). The instruments are calibrated semiannually using a Cs-137 standard or a pulser.

2. Alpha counters - Model 12 rate meters with Model 43-44 air proportional alpha probes manufactured by Ludlum Measurements Inc. were used to survey for alpha contamination. The instrument has four

ranges covering from 0-500,000 counts per minute. Alpha counters are calibrated semiannually using an alpha source traceable to NBS.

3. Gamma Detectors - Model 19 microR meters with NaI scintillation detectors manufactured by Ludlum Measurements Inc. were used in all locations. The instrument has three ranges from 0 - 5 mR/hr. The microR meters are normally returned to the manufacturer for calibration annually. Gamma spectral analysis on selected samples were performed using a high purity germanium detector manufactured by Canberra Industries, Inc.

4. Low level Alpha/Beta counting systems manufactured by Canberra were used to analyze wipe samples.

The alpha/beta systems and the germanium detector system have been calibrated for various types of samples. This calibration is checked on a daily or weekly basis depending on usage.

Measurement Limits for Release

The final survey results have been converted from cpm (counts per minute) for a particular detector to dpm/100 cm^2. Detector "background" cpm are subtracted from measured readings. The values are then corrected for efficiency and geometric factors associated with the instrumentation.

1. Background

   A "standard" natural background was determined for each instrument and subtracted from the survey readings. The surface beta/gamma readings were completed using the TBM Model 28 and Model 15 GM counters which have a background concrete reading of about 80 plus or minus 20 counts per minute.

2. Efficiency

   NBS traceable standards were used to calibrate instruments for various efficiencies. The standards consist of concrete blocks (one for each radionuclide) having an area of approximately 25 cm x 25 cm spiked with an NBS traceable standard liquid solution of the specific radionuclide i.e. Cs-137, 93% enriched uranium, depleted uranium and thorium. The maximum allowable level is 15,000 dpm for an area less than 100 cm^2 and the average allowable level for an area 1 meter by 1 meter or less is 5000 dpm/100 cm^2 (Attachments 4A and 4B). Surface measurements of the blocks were obtained with the instruments and percent efficiencies were obtained. The readings were corrected for efficiency by multiplying by the appropriate correction factor.

3. Geometry Correction
The acceptable values listed in Table 1 are in dpm/100 cm^2, therefore, a correction factor was applied to the measured values to correct for the smaller area of the detector. The Model TBM-28 and Model TBM-15 (geiger counters) have a 5 cm diameter detector which measures a 19.6 cm^2 area. The reading is therefore corrected by multiplying by 5.1. The alpha detectors used for the surveys "see", at any given time, an area of about 78.7 cm^2, which then requires a correction factor of 1.27.

PREVIOUS LABORATORY ACTIVITIES AND EFFORT OF DECONTAMINATION REQUIRED

A brief description of the previous use of the 11 laboratories (and the 3 mezzanines) over the past approximately 20 years is provided below. Since not all our records were reviewed, it was assumed that radioactive materials could have been used in each of the laboratories. Information is also provided below on the results of initial surveys and on the work involved in cleaning these labs.

Laboratory 317 (and the mezzanine above Laboratory 317)

Laboratory 317 was used from at least 11/25/74 to 11/25/75 (WA #2059) for adsorption isotherm studies using pseudo-isopiestic techniques. Ten millicuries (10 mCi) of each of the following isotopes were used; Cs-137, I-131, Ag-110, and Te-127. Records after 1975 indicate that these labs were no longer used for these type of studies. Surveys using geiger counters, alpha counters and microR meters showed no contamination on the floor (tiled), drains or walls of the laboratory or the mezzanine. The tile was removed and the concrete underneath the tile was also surveyed; no contamination was detected.

Laboratories 355/357 (combined lab without a mezzanine) and Laboratories 359/361 and the Mezzanines above Labs 359/361

Health Physics records show that work in these laboratories with radioactive materials began as early as 12/17/68 (WA #1361). The work involved "capsule instrumentation and encapsulation outgasing" using various enrichments of U-235 with a 500 gram limit.

These labs were used again from at least 8/13/75 (WA#2116) until around 4/85 (WA #2641). The work originally began in 1975, was for fuel kernel development and fuel coating development. Studies of diffusion of tritium through HTGR steam generator materials also was conducted in these labs. The labs were originally authorized for 350 grams of U-235 (there is also a notation in the records that as much as 3 kg's of U-235 may have been authorized), 20 kg's of U-238, 50 kg's of Th-232 and 2.1 Curies of H-3 to conduct these studies.

Since 1985, no work with radioactive materials has been conducted in these labs. Laboratories 355/357 had a contaminated hood and glove box. These items as well as other equipment in the laboratory which were found to be contaminated were transferred to another facility to be decontaminated or disposed of as radioactive waste. No contamination was detected on the floor (tiled) in this laboratory. The floor tiles were removed and the concrete underneath was surveyed. Two "spots", i.e. less than 100 cm^2, were found to be contaminated on the concrete floor; the contaminant was identified as thorium. One spot measured ~2000-3000 counts per minute (cpm) beta/gamma and about 50 cpm alpha. The other spot measured about 140 cpm beta/gamma and 50 cpm alpha before being decontaminated. Attachment 9 provides the results of the initial survey of the floor areas. During the survey of the walls of combined laboratory 359/361, two small areas were found to be slightly contaminated. The contaminant was also identified as thorium. The initial survey is provided in Attachment 10. One area (~100

cm^2) measured about 1000 cpm beta/gamma and about 50 cpm alpha. The other area (~ 1 ft^2) measured about 600 cpm beta/gamma and about 50 cpm alpha.

The concrete floor areas and the wall surfaces were cleaned/scabbled until the levels were at normal background levels i.e. well below the allowable release criteria.

Laboratories 554/556/558/560 (Combined Lab without a mezzanine)
Several Work Authorizations were issued for work in these labs over the years. From at least 1975 - 1979 (WA's 2062... 2309), work involving the use of tritium was authorized in these laboratories. For the past several years, the lab had been used for non-radioactive work involving stress testing of components. Surveys using geiger counters, alpha counters and microR meters in the laboratories and mezzanines showed only one small "spot" of contamination. The "spot" was in Lab 556; the contamination levels were ~300 cpm (beta/gamma) and ~250 cpm (alpha). The surface was cleaned to meet release criteria. Gamma spectroscopy measurements identified the contaminant as U-235. No other contamination was detected on the floors or walls of these labs.

Laboratories 562/564 (combined lab without a mezzanine)
No evidence of work involving radioactive materials could be found during a review of the records over the past 20 years. The lab had been used until recently as a welding development lab. Surveys using geiger counters, alpha counters and microR meters in the laboratories and mezzanines showed no contamination on the floors or walls of these laboratories.

FINAL RADIATION SURVEYS

Final surveys of all laboratories and associated mezzanines were conducted using the Model TBM-28 and Model TBM-15 geiger counters. The results of these surveys are shown in the attachments as described below. The measurements of average contamination were averaged over 1 $meter^2$ and are given in dpm/100 cm^2. The maximum contamination level applies to an area of not more than 100 cm^2.

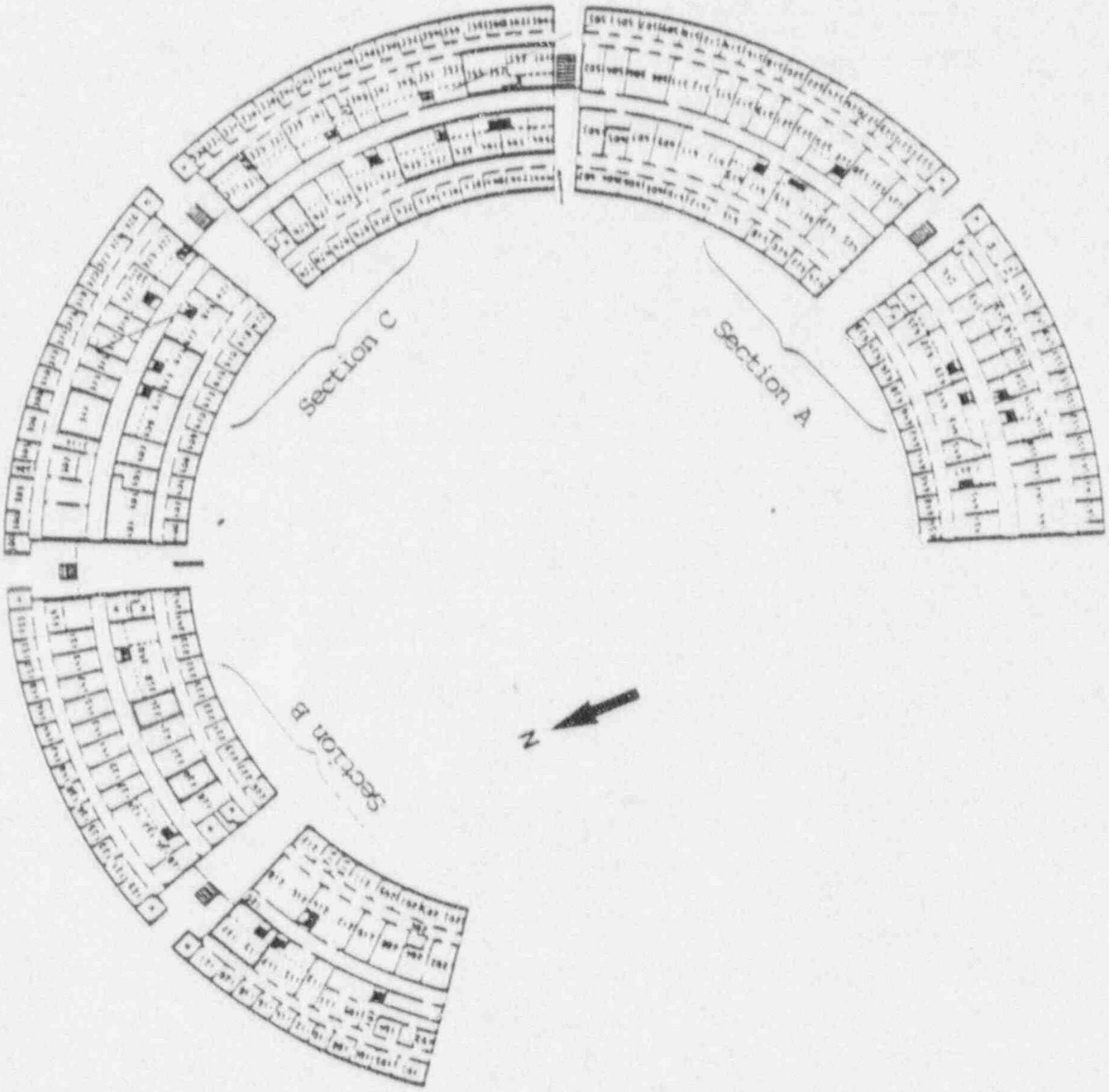
Attachment 5: Final Radiation Survey of Lab 317 and Mezzanine above Lab 317
Attachment 6: Final Survey of Walls (First Floor) of Lab 317
Attachment 7: Final Survey of Combined Labs 355/357
Attachment 8: Final Survey of Walls of Combined Labs 355/357
Attachment 9A: Final Survey of Combined Labs 359/361
Attachment 10A: Final Survey of Walls of Combined Labs 359/361
Attachment 11: Final Survey of Mezzanines above Combined Labs 359/361
Attachment 12: Final Survey of Combined Labs 554/556/558/560
Attachment 13: Final Survey of Walls of Combined Labs 554/556
Attachment 13A: Final Survey of Walls of Lab 558
Attachment 13B: Final Survey of Walls of Lab 560
Attachment 14: Final Survey of Combined Labs 562/564
Attachment 15: Final Survey of Walls of Combined Labs 562/564

A microR meter was also used to survey the laboratories and to measure floor radiation levels; results are provided in the attachments described above. These levels were all within normal background levels.

Very low alpha (less than 300 cpm) contamination levels were detected in the five (5) areas identified as requiring decontamination in combined lab 359/361 (two floor areas and two wall areas) and lab 556 (one floor area). These areas were decontaminated to natural background alpha levels i.e. measured alpha levels after decontamination were undetectable.

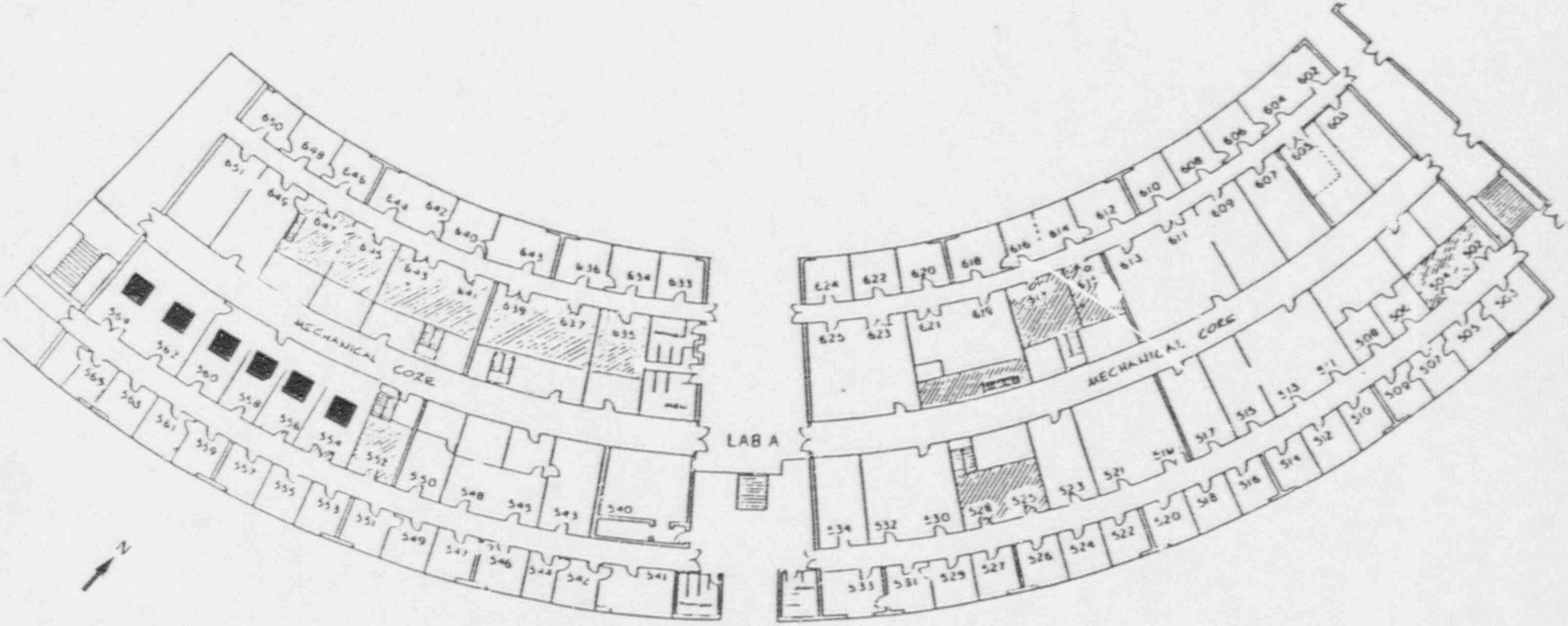
FINAL CONTAMINATION SURVEYS

Table 1 (Attachments 4A and 4B) provides limits for acceptable removable surface contamination levels. Contamination surveys (wipes) were conducted although no removable contamination was suspected i.e. the labs had not been used for several years and no fixed contamination was detected. The wipes were collected on the floors and the walls of the laboratories. The wipe sample locations are shown in the attachments described above and the results are shown in Attachments 16 through 19 as described below.



Attachment 2: L Building Complex (Building 2)

ATTACHMENT 3 (Page 1 of 2)



▨ Mezzanines above Labs

■ Group 4 Labs to be Released to Unrestricted Use

LABORATORY A BUILDING 2

Attachment 16: Contamination Survey Results for Lab 317 and Mezzanine above Lab 317 (1 page)
Attachment 17: Contamination Survey Results for Labs 355/357 and 359/361 and Mezzanine above Labs 359/361 (2 pages)
Attachment 18: Contamination Survey Results for Labs 554/556/558/560, (2 pages)
Attachment 19: Contamination Survey Results for Labs 562/564 (1 page)

The contamination levels in every location were < 20 dpm/100 cm^2 area, and well below the Table 1 limits (Attachments 4A and 4B) for removable contamination.

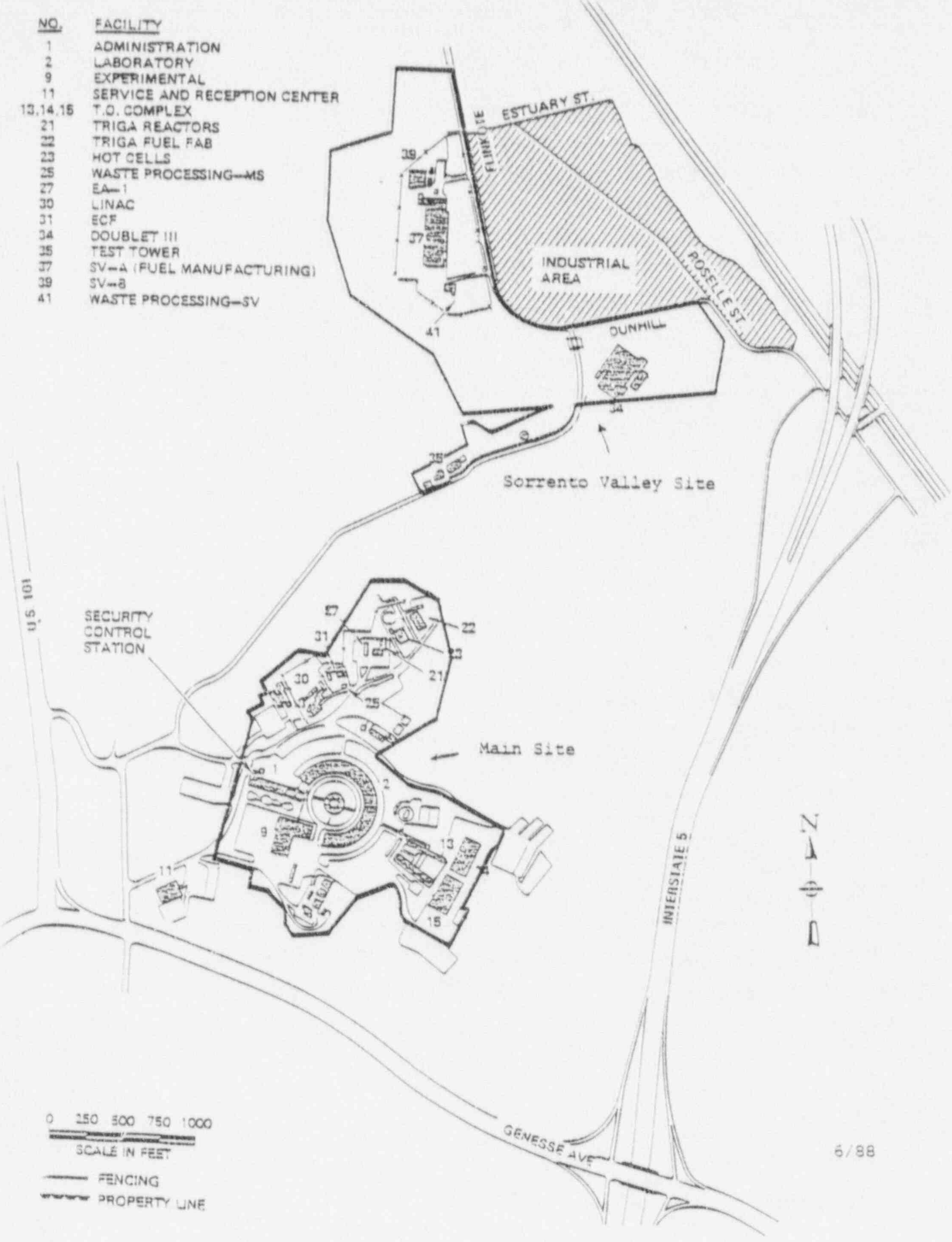
COMPLIANCE WITH THE TARGET CRITERIA

The laboratories were cleared of all radioactive materials and contaminated equipment.

All floors, walls and concrete surfaces were surveyed and found to be below the release levels specified in Table 1 (Attachments 4A and 4B). The final surveys provided in this report demonstrate compliance with the criteria for release to unrestricted use.

CONCLUSION

Final contamination and radiation surveys provided in this report for the 11 laboratories (3 of which have mezzanines) designated as **"Group 4"** demonstrate that the levels meet the approved guidelines for release to unrestricted use.

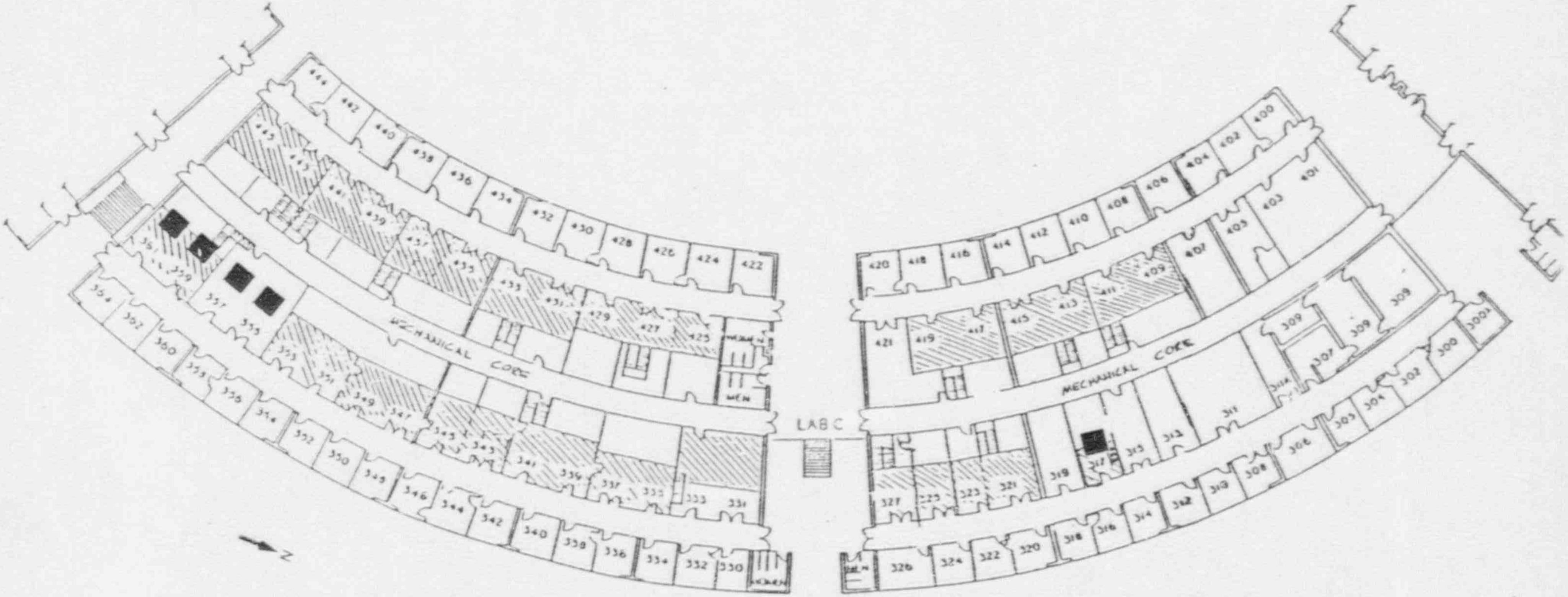


NO.	FACILITY
1	ADMINISTRATION
2	LABORATORY
9	EXPERIMENTAL
11	SERVICE AND RECEPTION CENTER
13,14,15	T.O. COMPLEX
21	TRIGA REACTORS
22	TRIGA FUEL FAB
23	HOT CELLS
25	WASTE PROCESSING—MS
27	EA—1
30	LINAC
31	ECF
34	DOUBLET III
35	TEST TOWER
37	SV—A (FUEL MANUFACTURING)
39	SV—B
41	WASTE PROCESSING—SV

6/88

ATTACHMENT 1: Plan View of Sites

ATTACHMENT 3 (Page 2 of 2)



▨ Mezzanines above Labs

■ Group 4 Labs to be Released to Unrestricted Use
(and mezzanines, if any)

LABORATORY C BUILDING 2

ATTACHMENT 4A

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES[a]	AVERAGE[b c f]	MAXIMUM[b d f]	REMOVABLE[b e f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126 I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm βγ/100 cm^2	15,000 dpm βγ/100 cm^2	1000 dpm βγ/100 cm^2

---

[a] Where surface contamination by both alpha- and beta gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

ATTACHMENT 4B

TABLE I
ACCEPTABLE SURFACE CONTAMINATION LEVELS1/2/

NUCLIDE[a]	AVERAGE[b c] (dpm/100 cm^2)	MAXIMUM[b d] (dpm/100 cm^2)	REMOVABLE[b e] (dpm/100 cm^2)
a) U-nat, U-235, U-238, and associated decay products	5,000	15,000	1,000
b) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231 Ac-227, I-125, I-129	100	300	20
c) Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
d) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
e) H-3, C-14 except as DNA precursors f/	20,000	60,000	4,000

---

re surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits ablished for alpha- and beta-gamma-emitting nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioacti material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm^2.

The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of know efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

DNA precursors mean molecules or compounds that are directly incorporated into the DNA molecule during DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and nucleosides. The acceptable surface contamination levels for H-3 and C-14 in DNA precursors are as tabulated in paragraph (d) for beta-gamma-emitters.

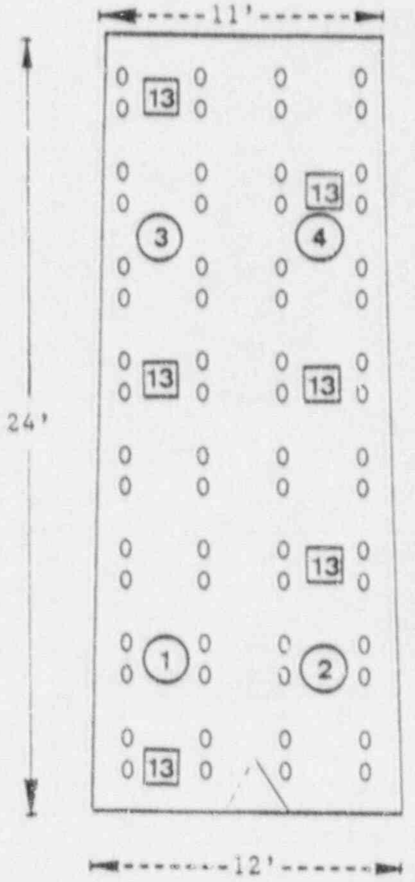
NRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, Washingto .C. (June 1974)

ANSI, Control of Radioactive Surface Contamination on Materials, Equipment and Facilities To Be Released for Uncontrolled Use, final draft, proposed American National Standard N-328, Atomic Industrial Forum, Inc., N.Y. (June 1974)

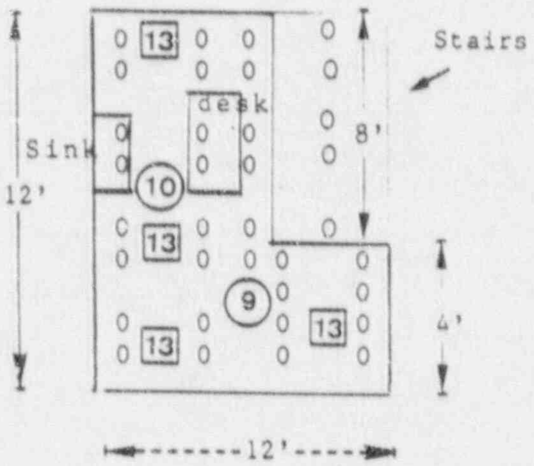
ATTACHMENT 5

FINAL SURVEY OF LAB 317 AND LAB 317 MEZZANINE

Lab 317 (first floor)



317 Mezzanine



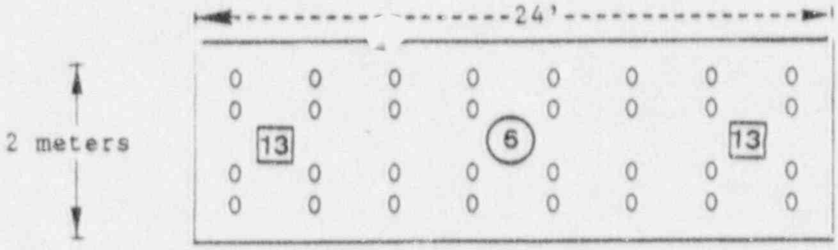
Notes:

1. Final survey completed August 29, 1989 using geiger counter TBM-28 #108113, calibrated May 2, 1989 and Model 19 microR meter #34915, calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are measured microR/hr radiation levels.
7. No contamination was detected on the floors (first floor or mezzanine) or the walls of this room.

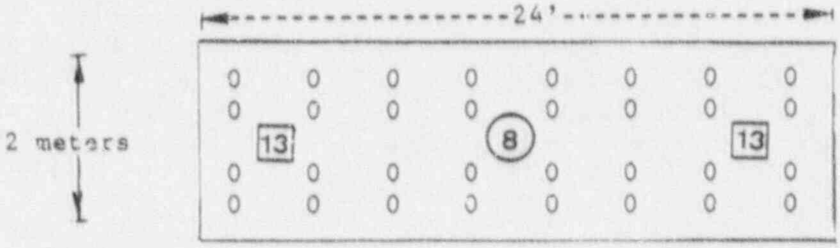
ATTACHMENT 6

FINAL SURVEYS OF LABORATORY 317 ROOM WALLS

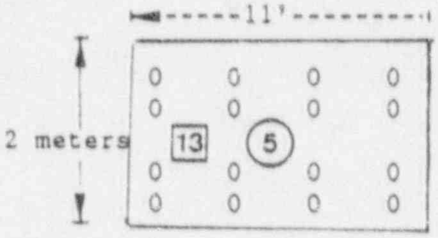
INITIAL AND FINAL SURVEY OF THE NORTHWEST WALL



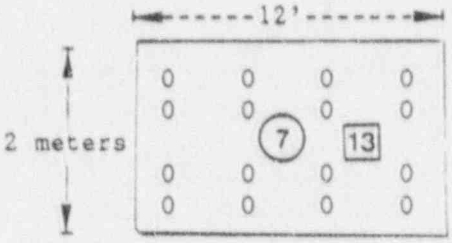
INITIAL AND FINAL SURVEY OF THE SOUTHEAST WALL



INITIAL AND FINAL SURVEY OF THE NORTHEAST WALL



INITIAL AND FINAL SURVEY OF THE SOUTHWEST WALL

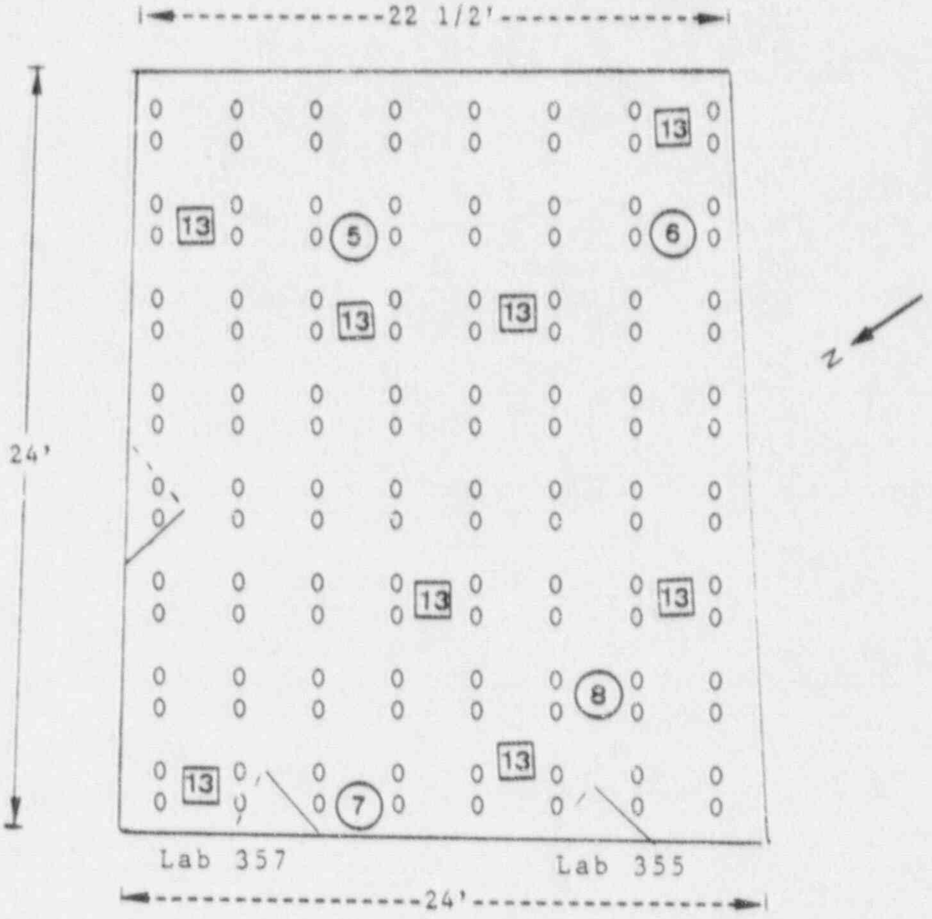


Notes:

1. Levels were measured on concrete floor.
2. Final surveys completed August 30, 1989 using TBM-28 geiger counter (# 108113, calibrated calibrated May 2, 1989.
3. Each unit represents a three foot by three foot area or less.
4. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
5. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
6. Circled numbers are wipe locations.
7. Numbers in squares are microR/hour surface radiation levels.
8. No contamination was detected on any of the walls.

ATTACHMENT 7

FINAL SURVEY OF COMBINED LABS 355/357

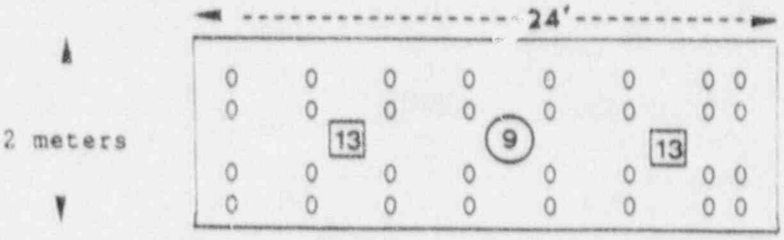


Notes:

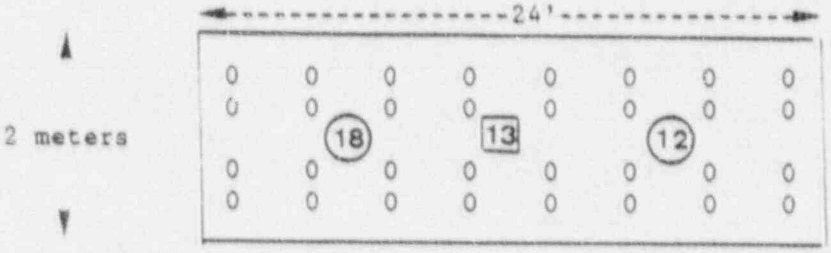
1. Final survey of labs completed August 30, 1989 using geiger counter TBM-15 #108113, calibrated May 2, 1989 and Model 19 microR meter #34915, calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are measured microR/hr radiation levels.
7. No contamination was detected on the floors or the walls of this room.

ATTACHMENT 8
FINAL SURVEY OF THE WALLS OF LABORATORIES 355/357

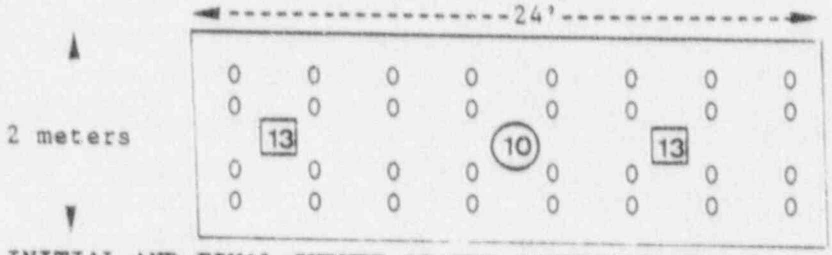
INITIAL AND FINAL SURVEY OF THE NORTHWEST WALL



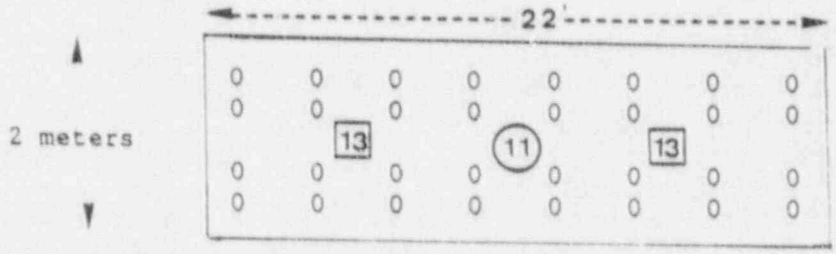
INITIAL AND FINAL SURVEY OF THE NORTHEAST WALL



INITIAL AND FINAL SURVEY OF THE SOUTHWEST WALL



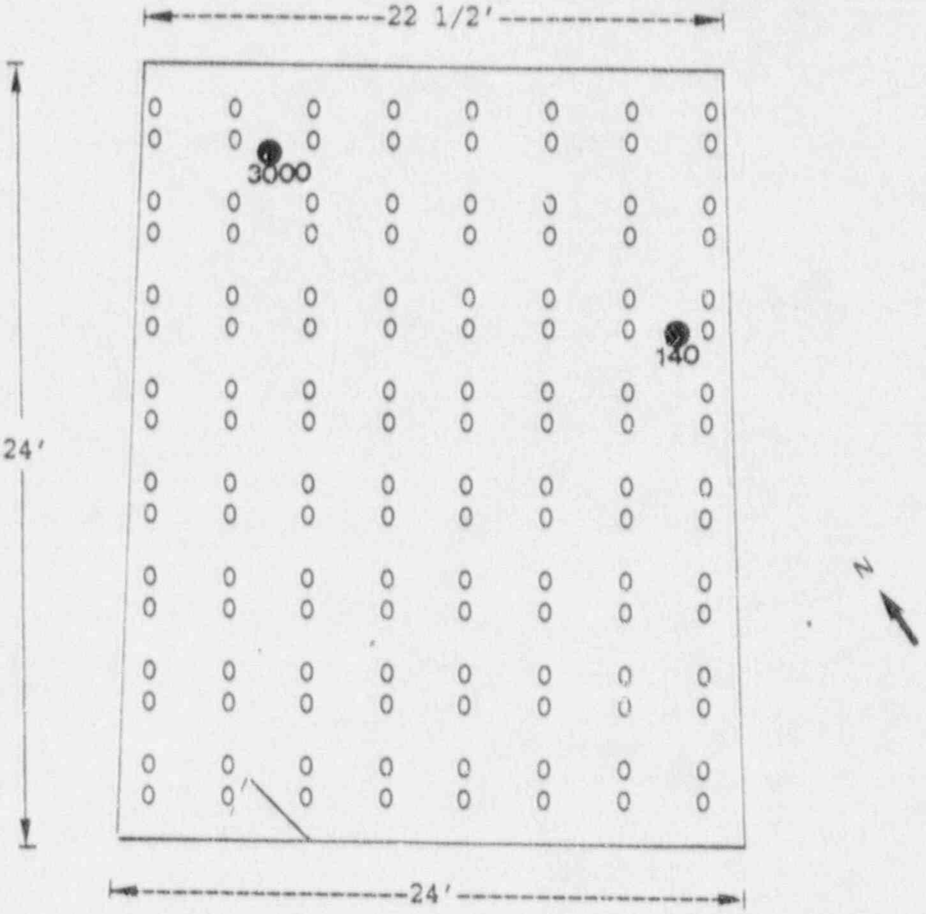
INITIAL AND FINAL SURVEY OF THE SOUTHEAST WALL



Notes:
1. Final surveys completed August 30, 1989 on the concrete floor using TBM-28 geiger counter (# 108113) calibrated calibrated May 2, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are microR/hour surface radiation levels.
7. No contamination was detected on any of the walls.

ATTACHMENT 9

INITIAL SURVEY OF COMBINED LABS 359/361

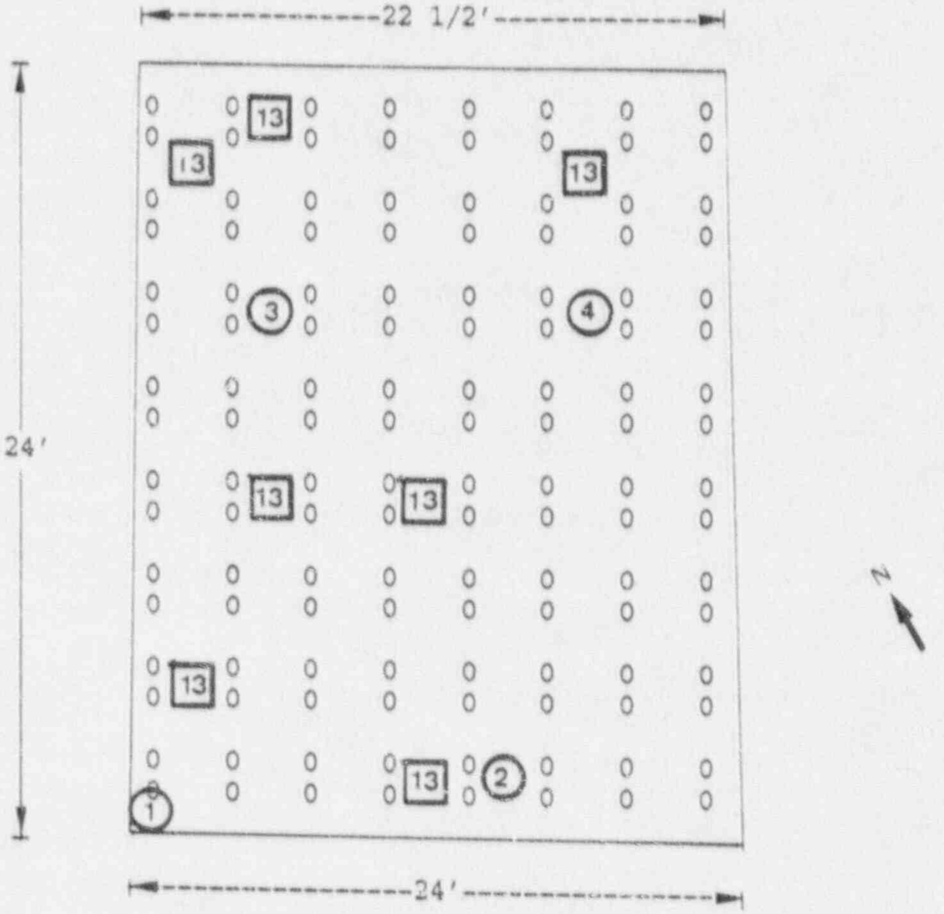


Notes:

1. Initial survey of labs completed September 11, 1989 using geiger counter TBM-28 #92238, calibrated July 20, 1989 and Model 19 microR meter #34915, calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Values are reported in counts per minute (cpm) beta/gamma. Background levels have been subtracted from the readings.
4. Two "spots", i.e. less than 100 cm^2, were found to be contaminated; contaminant was identified as thorium. One spot measured ~2000-3000 cpm beta/gamma and about 50 cpm alpha; the other spot measured ~140 cpm beta/gamma and ~50 cpm alpha before cleanup. Both spots were decontaminated to background levels (see Attachment 9A for final survey results).

ATTACHMENT 9A

FINAL SURVEY OF COMBINED LABS 359/361



Notes:

1. Final survey of labs completed September 11, 1989 using geiger counter TBM-28 #92238, calibrated July 20, 1989 and Model 19 microR meter #34915, calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are measured microR/hr radiation levels.
7. The two small areas (each ~100 cm^2) found to be slightly contaminated (see Attachment 9) were decontaminated to background levels.

ATTACHMENT 10
INITIAL SURVEY OF THE WALLS OF LABORATORIES 359/361

INITIAL SURVEY OF THE NORTHWEST WALL

24'

2 meters

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

INITIAL SURVEY OF THE NORTHEAST WALL

22 1/2'

2 meters

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

INITIAL SURVEY OF THE SOUTHWEST WALL

24'

2 meters

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

INITIAL SURVEY OF THE SOUTHEAST WALL

24'

8'

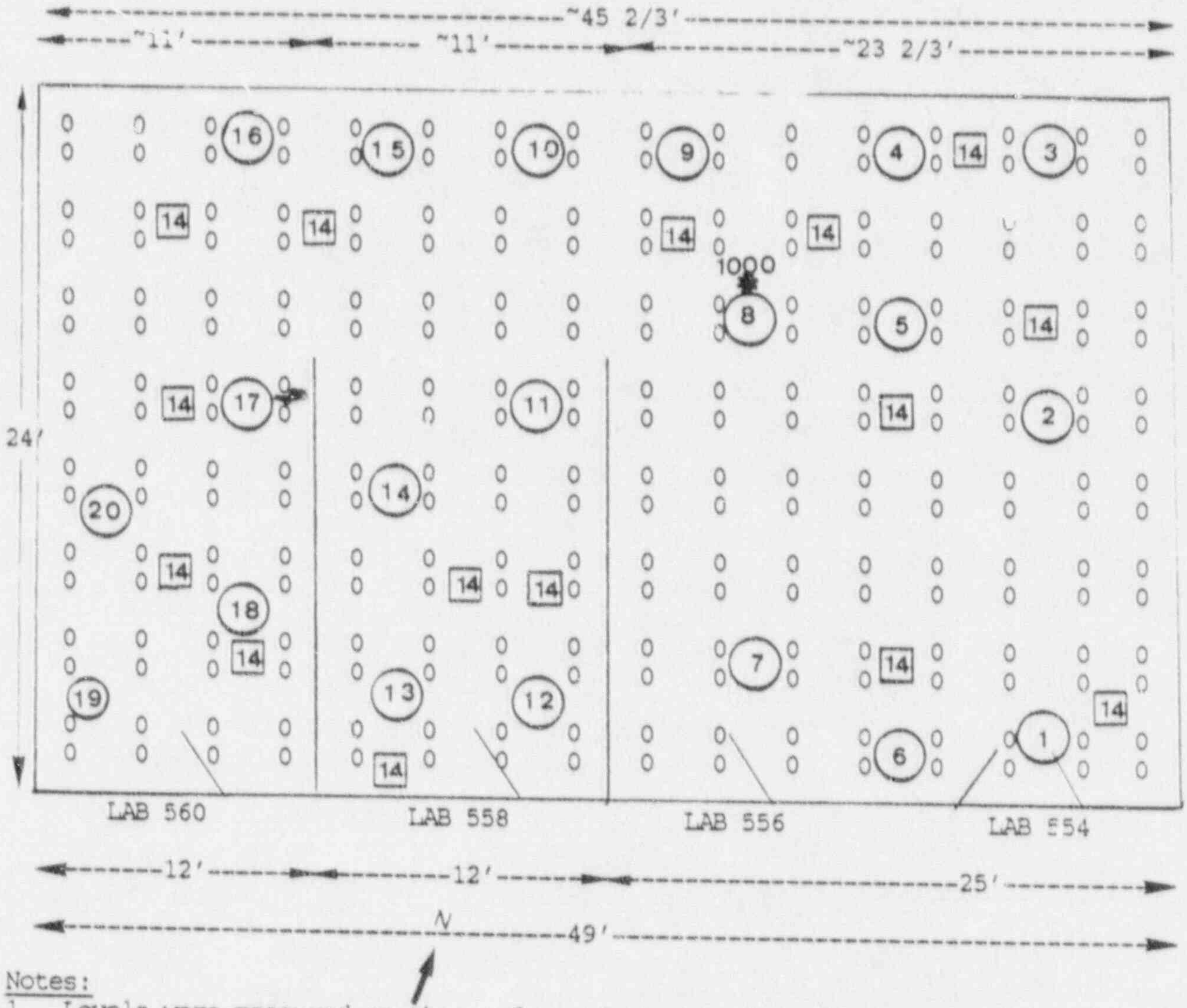
0	0	0	0	1000	0	0	0
0	0	0	0		0	0	0
0	0	0	0		0	0	0
0	0	0	0		0	0	0
0	0	0	0		600	0	0

Notes:

1. Final surveys completed September 11, 1989 on the concrete floor using TBM-28 geiger counter (# 92238) calibrated July 20, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Values provided are counts per minute (cpm) beta/gamma measurements using a TBM-28 geiger counter. Contaminant was identified as thorium.
4. The area identified as 1000 cpm beta/gamma represents an area ~100 cm^2; the other area identified as reading 600 cpm beta/gamma represents an area of ~ 1 ft^2. Both areas were decontaminated to background levels (see Attachment 10A).

ATTACHMENT 12

FINAL SURVEY OF COMBINED LABS 554/556/558/560



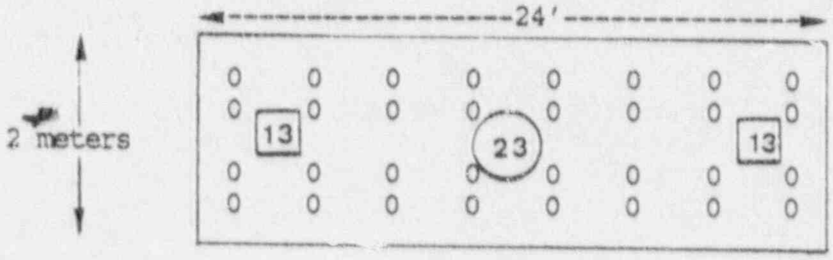
Notes:

1. Levels were measured on the surface of the concrete floor.
2. Final surveys completed September 7, 1989 using TBM-28 geiger counter (#108113) calibrated calibrated May 2, 1989 and Model 10 microR meter #34915, calibrated June 28, 1989.
3. Each unit represents a three foot by three foot area or less.
4. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
5. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
6. Circled numbers are wipe locations.
7. Numbers in squares are microR/hour surface radiation levels.
8. No contamination was detected on any of the floors or walls, except for a small spot (about 100 cm^2) indicated as ✱ , which measured about 350 cpm (beta/gamma) and about 250 cpm (alpha). It was decontaminated to less than 1000 dpm/100 cm^2.

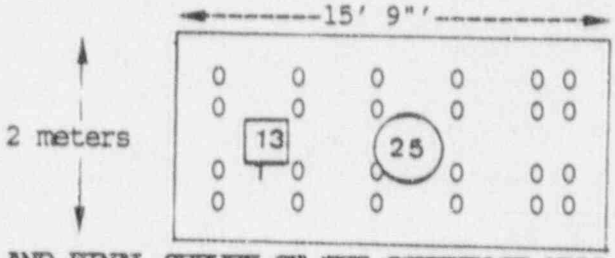
ATTACHMENT 13
FINAL SURVEYS OF WALLS OF COMBINED LABORATORIES 554/556

INITIAL AND FINAL SURVEY OF THE NORTHWEST WALL

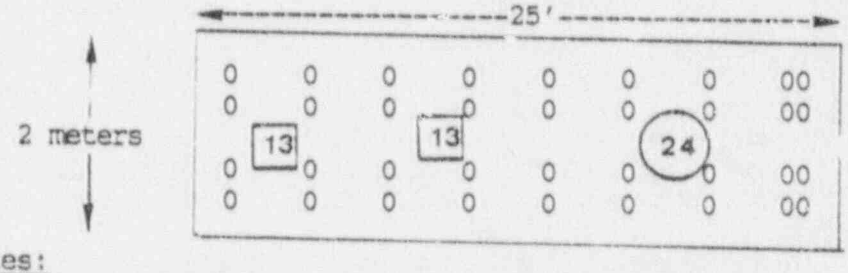
INITIAL AND FINAL SURVEY OF THE NORTHEAST WALL



INITIAL AND FINAL SURVEY OF THE SOUTHWEST WALL



INITIAL AND FINAL SURVEY OF THE SOUTHEAST WALL

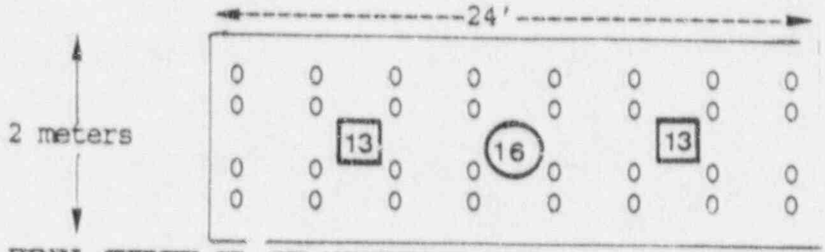


Notes:

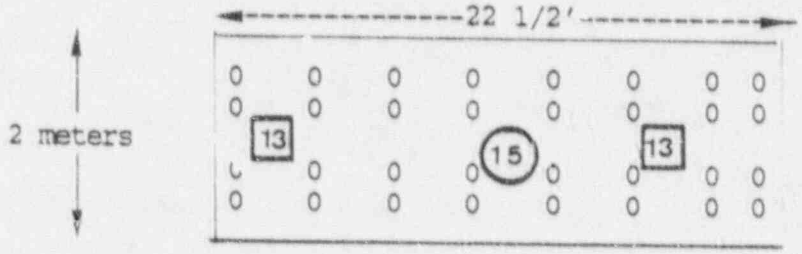
1. Final surveys completed September 7, 1989 on the concrete floor using TBM-28 geiger counter (# 108113) calibrated calibrated May 2, 1989 and Model 19 microR meter #34915 calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are microR/hour surface radiation levels.
7. No contamination was detected on any of the walls.

ATTACHMENT 10A
FINAL SURVEY OF THE WALLS OF LABORATORIES 359/361

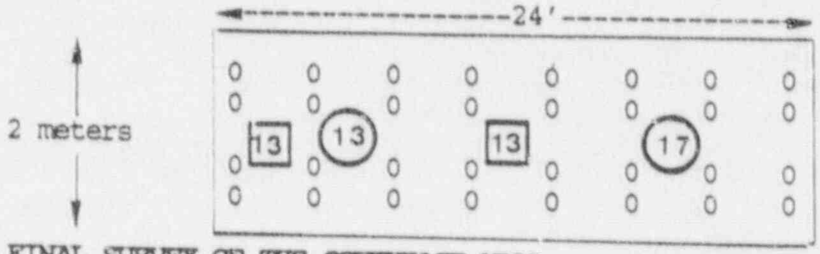
FINAL SURVEY OF THE NORTHWEST WALL



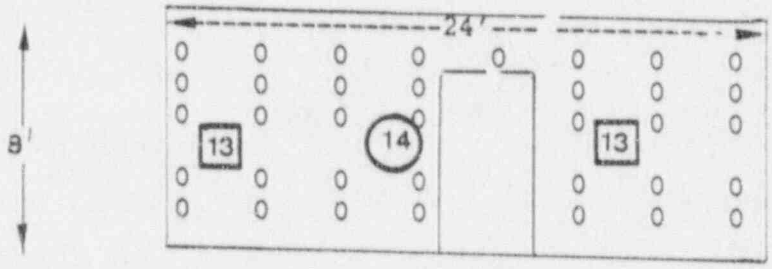
FINAL SURVEY OF THE NORTHEAST WALL



FINAL SURVEY OF THE SOUTHWEST WALL



FINAL SURVEY OF THE SOUTHEAST WALL

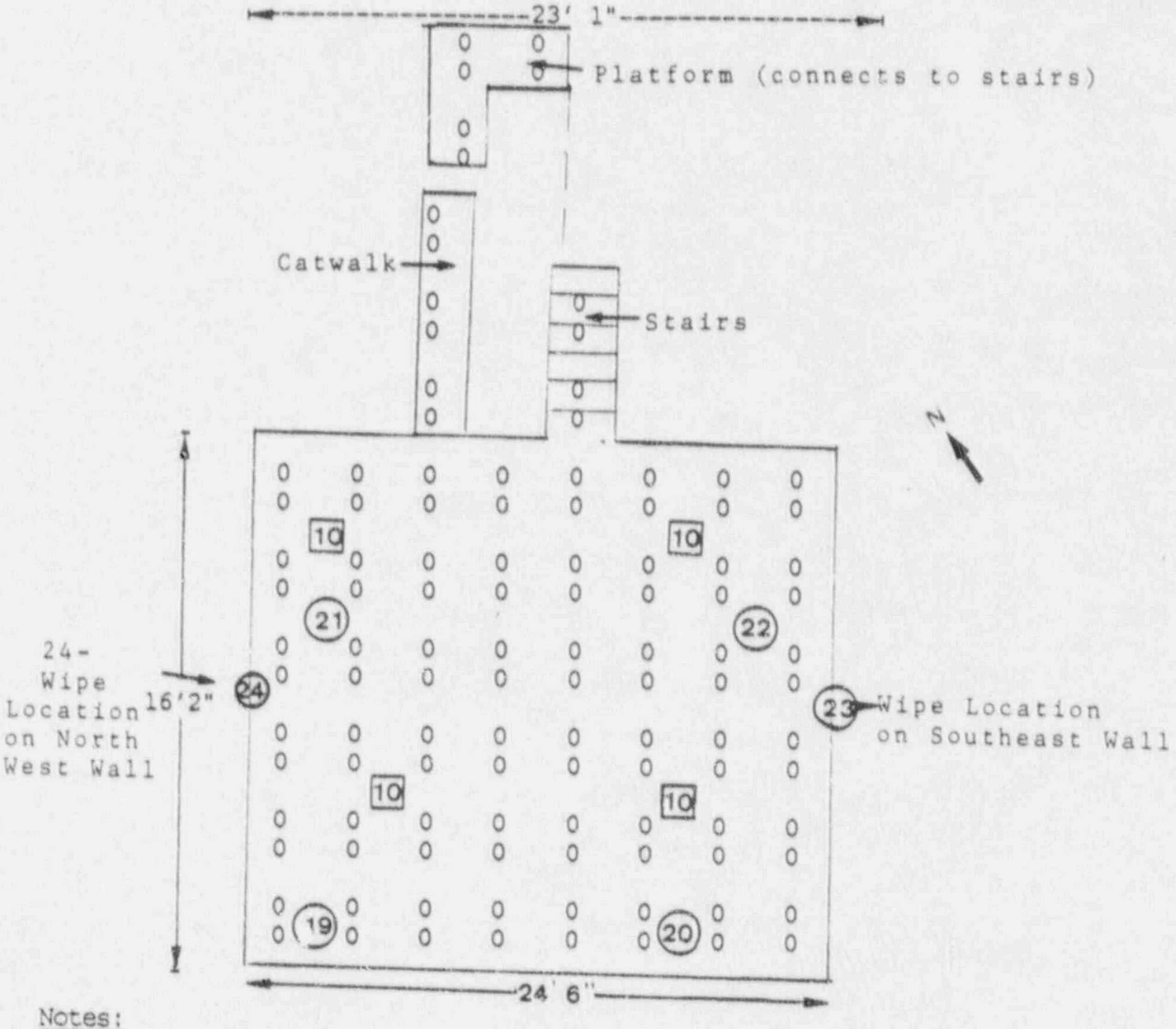


Notes:

1. Final surveys completed September 11, 1989 on the concrete floor using TBM-28 geiger counter (#92238) calibrated July 20, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are microR/hour surface radiation levels.
7. The two small area on the southeast wall (see Attachment 10A) were decontaminated to background levels.

ATTACHMENT 11

FINAL SURVEY OF MEZZANINE ABOVE COMBINED LABS 359/361

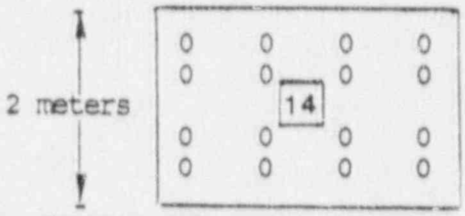


Notes:

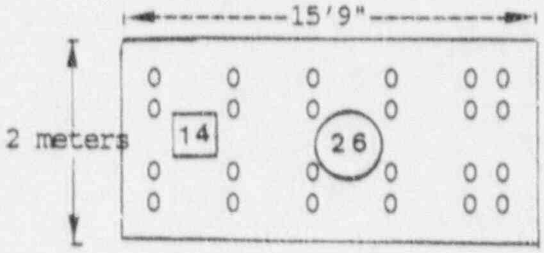
1. Final survey of labs completed August 30, 1989 using geiger counter TBM-15 #108113, calibrated May 2, 1989 and Model 19 microR meter #34915, calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are measured microR/hr radiation levels.
7. No contamination was detected on the floors or the walls of this room.

ATTACHMENT 13A
FINAL SURVEYS OF WALLS OF LABORATORY 558

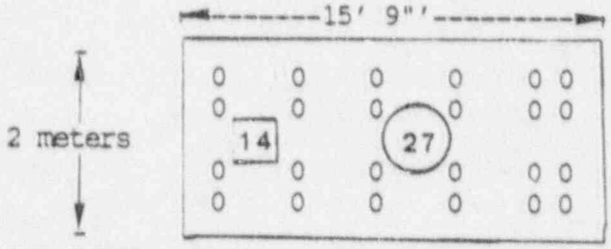
INITIAL AND FINAL SURVEY OF THE NORTHWEST WALL



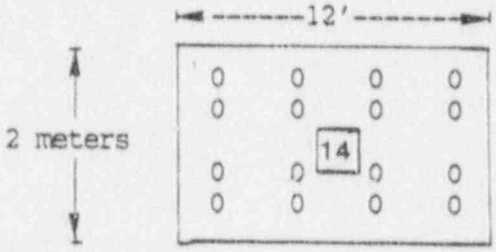
INITIAL AND FINAL SURVEY OF THE NORTHEAST WALL



INITIAL AND FINAL SURVEY OF THE SOUTHWEST WALL



INITIAL AND FINAL SURVEY OF THE SOUTHEAST WALL

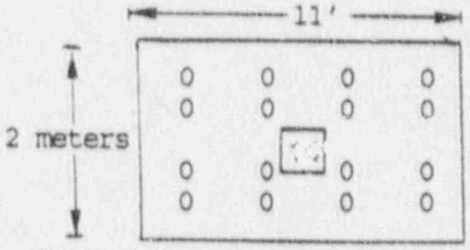


Notes:

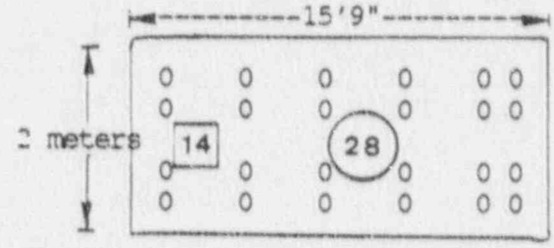
1. Final surveys completed September 1, 1989 on the concrete floor using TBM-28 geiger counter (# 108113) calibrated calibrated May 2, 1989 and Model 19 microR meter #34915 calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are microR/hour surface radiation levels.
7. No contamination was detected on any of the walls.

ATTACHMENT 13B
FINAL SURVEYS OF WALLS OF LABORATORY 560

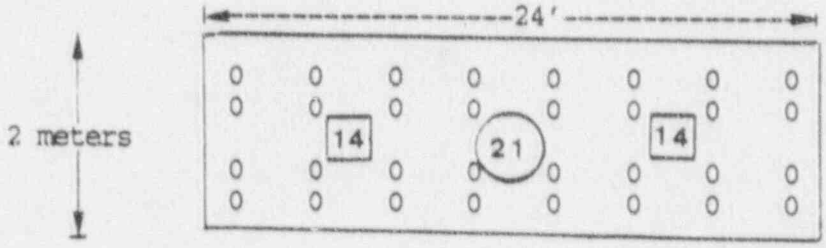
INITIAL AND FINAL SURVEY OF THE NORTHWEST WALL



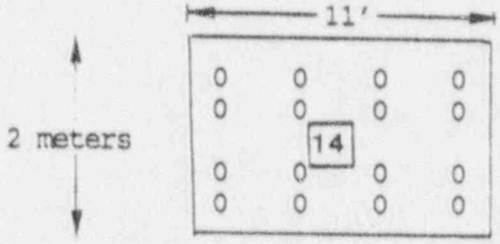
INITIAL AND FINAL SURVEY OF THE NORTHEAST WALL



INITIAL AND FINAL SURVEY OF THE SOUTHWEST WALL



INITIAL AND FINAL SURVEY OF THE NORTHWEST WALL



Notes:

1. Final surveys completed September 1, 1989 on the concrete floor using TBM-28 geiger counter (# 108113) calibrated calibrated May 2, 1989 and Model 19 microR meter #34915 calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are microR/hour surface radiation levels.
7. No contamination was detected on any of the walls.

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ERROR 95% CL
24 SE Wall Lab 554/556	1.	<1.049E-02	95.00	<9.194E-01	95.00
25 SW Wall 554/556	1.	<1.049E-02	95.00	<3.277E-02	95.00
26 NE Wall 554/556	1.	<1.049E-02	95.00	<3.277E-02	95.00
27 SW Wall 558	1.	<1.049E-02	95.00	<3.277E-02	95.00
28 NE Wall Lab 560	1.	2.798E-01	230.60	<3.727E-01	95.00
AVERAGE		4.896E-02		3.479E-01	
HIGH		2.798E-01		1.415E 00	
LOW		1.049E-02		3.277E-02	

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.
(SEE ATTACHMENTS 12, 13, 13A and 13B for WIPE LOCATIONS)

ATTACHMENT 18: CONTAMINATION SURVEY RESULTS FOR LABS 554/556/558/560

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

SEP 06 1989

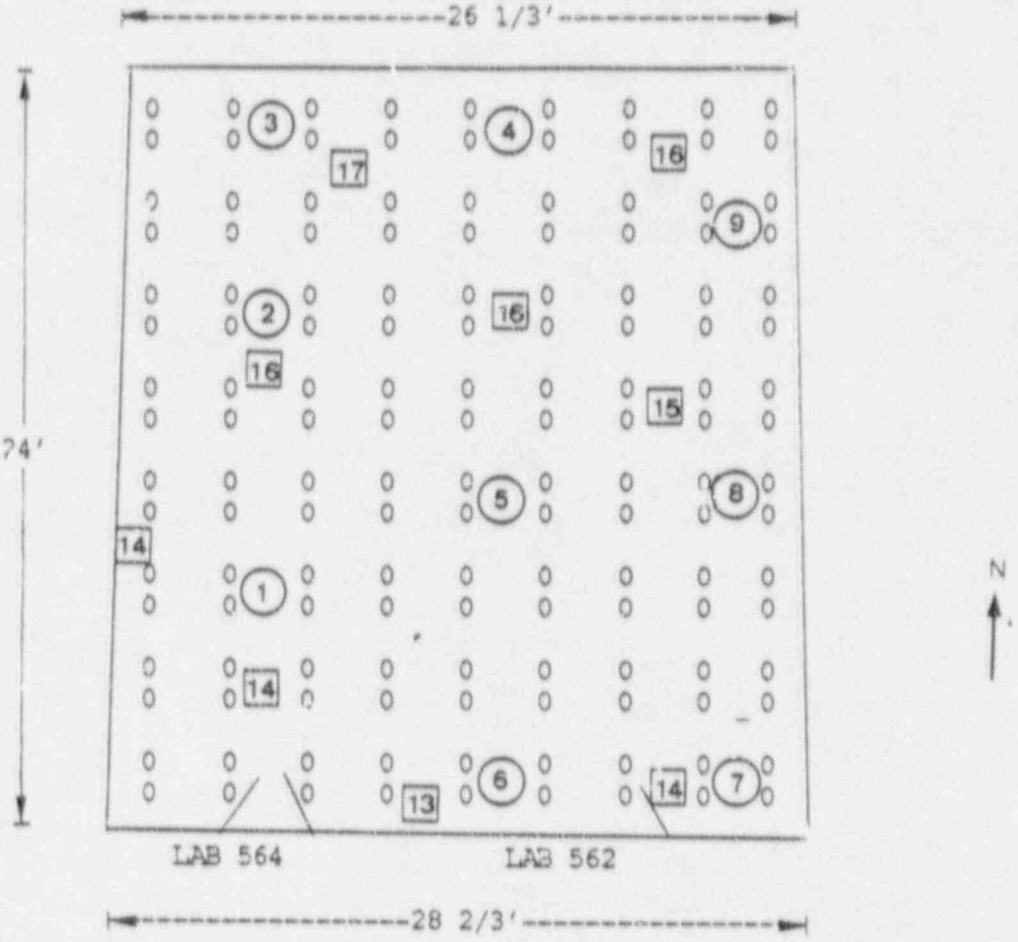
SAMPLE [illegible]	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ER 95%
L562/564 W-1 Labs 562/564	1.	<1.049E-02	95.00	<1.415E 00	95.00
2 9/5/89 Labs 562/564	1.	2.798E-01	230.60	7.827E-01	163.07
3 Labs 562/564	1.	<1.049E-02	95.00	<3.277E-02	95.00
4 Labs 562/564	1.	<1.049E-02	95.00	<3.277E-02	95.00
5 Labs 562/564	1.	2.798E-01	230.60	<9.194E-01	95.00
6 Labs 562/564	1.	6.090E-01	149.83	<3.277E-02	95.00
7 Labs 562/564	1.	<1.049E-02	95.00	<3.727E-01	95.00
8 Labs 562/564	1.	<1.049E-02	95.00	<3.727E-01	95.00
9 Labs 562/564	1.	<1.049E-02	95.00	<3.277E-02	95.00
10East Wall	1.	9.382E-01	119.12	<3.277E-02	95.00
11 North Wall	1.	<1.049E-02	95.00	<3.277E-02	95.00
12 West Wall	1.	<1.049E-02	95.00	<3.277E-02	95.
13 South Wall	1.	<1.049E-02	95.00	<9.194E-01	95.00
AVERAGE		1.693E-01		3.855E-01	
HIGH		9.382E-01		1.415E 00	
LOW		1.049E-02		3.277E-02	

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.
(SEE ATTACHMENTS 14 and 15 FOR WIPE LOCATIONS)

ATTACHMENT 19: CONTAMINATION SURVEY RESULTS FOR LABS 562/564

ATTACHMENT 14

FINAL SURVEY OF COMBINED LABS 562/564



Notes:

1. Final survey of labs completed September 1, 1989 using geiger counter TBM-15 #108113, calibrated May 2, 1989 and Model 19 microR meter #34915, calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are measured microR/hr radiation levels.
7. No contamination was detected on the floors or the walls of this room.

ATTACHMENT 15
FINAL SURVEYS OF WALLS OF COMBINED LABORATORIES 562/564

INITIAL AND FINAL SURVEY OF THE NORTH WALL

26' 4"

2 meters

0	0	0	$\boxed{17}$ 0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
			⑪					
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

INITIAL AND FINAL SURVEY OF THE WEST WALL

24'

2 meters

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
			⑫				
0	0 $\boxed{14}$	0	0	0	0	0	0
0	0	0	0	0	0	0	0

INITIAL AND FINAL SURVEY OF THE EAST WALL

24'

2 meters

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
			⑩				$\boxed{13}$
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

INITIAL AND FINAL SURVEY OF THE SOUTH WALL

28'8 "

2 meters

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
			⑬						
0	0	0	0	0	0	0	0	0	0
0	0 $\boxed{15}$	0	0	0	0	0 $\boxed{14}$	0	0	0

Notes:

1. Final surveys completed September 1, 1989 on the concrete floor using TBM-28 geiger counter (# 108113) calibrated calibrated May 2, 1989 and Model 19 microR meter #34915 calibrated June 28, 1989.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are microR/hour surface radiation levels.
7. No contamination was detected on any of the walls.

AUG 3 0 1989

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

		ALPHA		BETA	
SAMPLE ID	COUNT LENGTH MIN	DPM/100 SQ.CM.	% ERROR 95% CL	DPM/100 SQ.CM.	% ERROR 95% CL
L317W-1 Lab 317	1.	<1.049E-02	95.00	<3.727E-01	95.00
2 8/30/89 Lab 317	1.	<1.049E-02	95.00	<3.727E-01	95.00
3 Lab 317	1.	<1.049E-02	95.00	<3.727E-01	95.00
4 Lab 317	1.	<1.049E-02	95.00	<3.277E-02	95.00
5 NE Wall Lab 317	1.	<1.049E-02	93.00	<3.277E-02	95.00
6 NW Wall Lab 317	1.	<1.049E-02	95.00	0.130E-01	156.80
7 SW Wall Lab 317	1.	<1.049E-02	95.00	<9.194E-01	95.00
8 SE Wall Lab 317	1.	<1.049E-02	95.00	<3.277E-02	95.00
9 Lab 317 Mezzanine		<1.049E-02	95.00	<9.194E-01	95.00
10 Lab 317 Mezz	1.	<1.049E-02	95.00	<3.727E-01	95.00
AVERAGE		1.049E-02		4.241E-01	
HIGH		1.049E-02		9.194E-01	
LOW		1.049E-02		3.277E-02	

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

SEE ATTACHMENTS 5 and 6 FOR WIPE LOCATIONS:

1-4 (Attachment 5)
5-8 (Attachment 6)
9-10 (Attachment 5)

ATTACHMENT 16: CONTAMINATION SURVEY RESULTS FOR LAB 317 AND LAB 317 MEZZANINE

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES   Page 1 of 2

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ER 95%
02-357,359,3	1.	<1.049E-02	95.00	<3.277E-02	95.00
2 LAB 359/361 8/30/89 Lab 359/361	1.	<1.049E-02	95.00	<3.277E-02	95.00
3 Lab 359/361	1.	2.798E-01	230.60	<3.277E-02	95.00
4 Lab 359/361	1.	2.798E-01	230.60	<3.727E-01	95.00
5 Labs 355/357	1.	<1.049E-02	95.00	<3.277E-02	95.00
6 Labs 355/357	1.	<1.049E-02	95.00	<1.415E 00	95.00
7 Labs 355/357	1.	<1.049E-02	95.00	<3.277E-02	95.00
8 Labs 355/357	1.	<1.049E-02	95.00	<9.194E-01	95.00
9 Walls of Labs 355/357 (NW)	1.	<1.049E-02	95.00	<3.727E-01	95.00
10 Walls-Labs 355/357 (SW)	1.	<1.049E-02	95.00	<9.194E-01	95.00
11 Walls-Labs 355/357 (SE)	1.	<1.049E-02	95.00	<3.727E-01	95.00
12 Walls-Labs 355/357 (NE)	1.	<1.049E-02	95.00	<3.727E-01	95
13 Walls- 359/361	1. (SW)	<1.049E-02	95.00	<3.277E-02	95.00
14 Walls-359/361 (SE)	1.	2.798E-01	230.60	<9.194E-01	95.00
15 Walls- 359/361 (NE)	1.	2.798E-01	230.60	<9.194E-01	95.00
16 Walls- 359/361 (NW)	1.	2.798E-01	230.60	<3.727E-01	95.00
17 Walls- 359/361 (SW)	1.	<1.049E-02	95.00	<3.277E-02	95.00
18 NE Wall-355/357 (NE)	1.	9.382E-01	119.12	<1.415E 00	95.00
19 359/361 Mezz	1.	<1.049E-02	95.00	<3.727E-01	95.00
20 359/361 Mezz	1.	<1.049E-02	95.00	<3.727E-01	95.00
21 359/361 Mezz	1.	2.798E-01	230.60	<3.277E-02	95.00
22 359/361 Mezz	1.	2.798E-01	230.60	<1.415E 00	95.00
23 SE Wall of 359/361 Mezz	1.	<1.049E-02	95.00	<3.727E-01	95.00

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.
(SEE ATTACHMENTS 7, 8, 9, AND 10 FOR WIPE LOCATIONS)

ATTACHMENT 17: CONTAMINATION SURVEY RESULTS FOR LABS
355/357 and 359/361

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

Page 2 of 2

		ALPHA		BETA	
SAMPLE ID	COUNT LENGTH MIN	DPM/100 SQ.CM.	% ERROR 95% CL	DPM/100 SQ.CM.	% ERROR 95% CL
24 West Wall 359/361 Mezz	1.	<1.049E-02	95.00	<3.277E-02	95.00
AVERAGE		1.277E-01		4.466E-01	
HIGH		9.382E-01		1.415E 00	
LOW		1.049E-02		3.277E-02	

NOTE! THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

ATTACHMENT 17: CONTAMINTION SURVEY RESULTS FOR LABS 355/357 and LABS 359/361

SEP 07 1989

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

Page 1 of 2

SAMPLE ID	COUNT LENGTH MIN	ALPHA DPM/100 SQ.CM.	ALPHA % ERROR 95% CL	BETA DPM/100 SQ.CM.	BETA % ER 95%
L554-560 W-1 Labs 554/556	1.	2.798E-01	230.60	<3.277E-02	95.00
2 9/7/89 Labs 554/556	1.	<1.049E-02	95.00	<3.727E-01	95.00
3 Labs 554/556	1.	<1.049E-02	95.00	<9.194E-01	95.00
4 Labs 554/556	1.	<1.049E-02	95.00	<1.415E 00	95.00
5 Labs 554/556	1.	<1.049E-02	95.00	<3.277E-02	95.00
6 Labs 554/556	1.	<1.049E-02	95.00	<3.727E-01	95.00
7 Labs 554/556	1.	<1.049E-02	95.00	<3.277E-02	95.00
8 Labs 554/556	1.	2.798E-01	230.60	<3.277E-02	95.00
9 Labs 554/556	1.	<1.049E-02	95.00	<3.277E-02	95.00
10 Lab 558	1.	<1.049E-02	95.00	<3.727E-01	95.00
11 Lab 558	1.	<1.049E-02	95.00	<3.727E-01	95.00
12 Lab 558	1.	2.798E-01	230.60	<3.277E-02	95.
13 Lab 558	1.	<1.049E-02	95.00	<9.194E-01	95.00
14 Lab 558	1.	<1.049E-02	95.00	<3.727E-01	95.00
15 Lab 558	1.	<1.049E-02	95.00	<3.277E-02	95.00
16 Lab 560	1.	<1.049E-02	95.00	<3.727E-01	95.00
17 Lab 560	1.	<1.049E-02	95.00	<1.415E 00	95.00
18 Lab 560	1.	<1.049E-02	95.00	<3.727E-01	95.00
19 Lab 560	1.	<1.049E-02	95.00	<3.277E-02	95.00
20 Lab 560	1.	<1.049E-02	95.00	<3.277E-02	95.00
21 SW Wall 560	1.	<1.049E-02	95.00	<3.277E-02	95.00
22 NW Wall 554/556	1.	<1.049E-02	95.00	<3.727E-01	95.00
23 NE Wall 554/556	1.	<1.049E-02	95.00	<3.727E-01	95.00

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.
(SEE ATTACHMENTS 12, 13, 13A and 13B for WIPE LOCATIONS)

ATTACHMENT 18: CONTAMINATION SURVEY RESULTS FOR LABS 554/556/558/560

GENERAL ATOMICS

October 17, 1989
696-1464

Mr. R. F. Fish, Chief
Emergency Preparedness Section
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Subject: Docket No. 70-734: SNM-696; Addendum to "Group 3" Report dated December 21, 1988

References:
1) Asmussen, K. E., letter no. 696-1318 to Mr. Robert D. Thomas, "Request for Release of Selected Laboratories to Unrestricted Use (Group 3)," dated December 21, 1988.
2) Cotten, P. R.. "Confirmatory Survey of Facilities in Buildings 2 and 9 / General Atomics / San Diego, California," Final Report ORAU 89/F-98, July 1989.

Dear Mr. Fish:

In December 1988, General Atomics (GA) submitted its final survey report in support of a request for a confirmatory survey of a group of laboratories in GA's Building 2 (Ref. 1). That group of science laboratories was referred to as "Group 3." Subsequent to that request, GA requested that three additional laboratory rooms and an affected office in Building 2 be added to "Group 3." The affected office was included because a trench had to be dug in its floor to remove an underground drain line. In support of this later request, GA transmitted your office, by FAX, a brief description of the areas to be added and some associated survey information. The Group 3 areas, including the added rooms and affected office, were surveyed by the Oak Ridge Associated Universities' Environmental Survey and Site Assessment Team (ORAU) during their visit to GA's site March 14-23, 1989.

ORAU's final report (Ref. 2) documented the results of their confirmatory survey of GA's "Group 3" laboratories, including the additional three laboratory rooms (lab 315 and rooms 1 and 2 of lab 309) and the affected office (room 302). As evidenced by the information in their report, ORAU concluded that all the areas surveyed meet the NRC

10955 JOHN JAY HOPKINS DRIVE, SAN DIEGO, CA 92121-1194 PO BOX 85608, SAN DIEGO, CA 92138-5608 (619) 455-3000

(and State of California) approved criteria for release to unrestricted use.

ORAU's exit meeting, held on March 23, 1989, at the conclusion of their confirmatory surveys of the Group 3 laboratories, was attended by Mr. B. Brock of NRC Region V and Mr. K. Wong of the State of California. At that meeting, GA agreed to formally document and submit for the record the results of the radiation and contamination surveys GA performed on the three added laboratory rooms and the affected office prior to ORAU's visit of March 14-23, 1989. This report was to be more comprehensive and to supersede the preliminary and abbreviated reports previously transmitted by FAX. Accordingly, enclosed are three copies of such a report in the form of an addendum (dated September 22, 1989) to GA's "Group 3" report of December 21, 1988.

If you should have any questions regarding this supplemental information, please contact me at (619) 455-2823.

Very truly yours,

Keith E. Asmussen

Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

Enclosure (3 copies): Report entitled, "*Decontamination of Selected General Atomics' Science Laboratories For Release to Unrestricted Use / Addendum to "Group 3" Report Dated December 21, 1988 (This Report Adds Lab 315 and Rooms 1 and 2 of Lab 309),*" dated September 22, 1989

cc: Ms. Mary Horn, NRC Headquarters

DECONTAMINATION OF SELECTED GENERAL ATOMICS' SCIENCE LABORATORIES FOR RELEASE TO UNRESTRICTED USE

ADDENDUM TO "GROUP 3" REPORT DATED DECEMBER 21, 1988
(THIS REPORT ADDS LAB 315 AND ROOMS 1 AND 2 OF LAB 309)

September 22, 1989

TABLE OF CONTENTS

LIST OF ATTACHMENTS

INTRODUCTION

General Atomics has been involved in the process of decontaminating and obtaining the release to unrestricted use of selected laboratories and associated offices in GA's Building 2 (also known as the Science Laboratories Building). A number of laboratories were released earlier this year in two groups designated as "Group 1" and "Group 2". Group 1 involved the release of twenty-five (25) laboratories and Group 2 involved the release of thirteen (13) laboratories. In addition, another group of laboratories have been decontaminated; this group has been designated as "Group 3". "Group 3" consists of fifteen (15) laboratories (12 of these laboratories have mezzanines) and nine (9) other mezzanines located above laboratories which are not being released at this time. These later laboratories are currently occupied; however, none of the activities involve the use of radioactive material.

On December 21, 1988, GA submitted a report summarizing the final surveys completed for "Group 3" laboratories (Reference 1). Subsequently, GA also decontaminated Laboratory 315 and Rooms 1 and 2 in Laboratory 309. Preliminary surveys were provided to the Nuclear Regulatory Commission (NRC) on February 28, 1989 summarizing the decontamination efforts. These preliminary surveys are also provided in this report. Attachment 1 is the survey of Laboratory 315 and Attachment 2 is the survey of Rooms 1 and 2 of Laboratory 309. Note: Room 3 of Laboratory 309, Laboratory 307 and Room 311A (surveys conducted in room 311A in 1977 show some residual contamination which may require decontamination) will be decontaminated at a later date.

Under contract with the NRC, Oak Ridge Associated Universities (ORAU) conducted a confirmatory survey of the "Group 3" laboratories and the Stage 2 area of Building 9 during the period March 14-24, 1989. ORAU included Lab 315 and Rooms 1 and 2 of Lab 309 in their confirmatory survey. A final report documenting these surveys was completed in July 1989 (Reference 2). The labs have been released to unrestricted use.

This report formally documents GA's surveys of lab 315 and Rooms 1 and 2 of Lab 309 and provides information on soil sample results after cleanup of Rooms 1 and 2 of Lab 309.

The total area of lab 315 is 288 ft^2 and the total area of rooms 1 and 2 of lab 307/309 is 620 ft^2; for a total of 908 ft^2.

A brief history of the use of these laboratories is provided. The primary radionuclides previously used in these laboratories were Cs-137, Sr-90, and other fission products, Co-60 and other activation products, as well as uranium (including various enrichments of U-235) and thorium.

Both of these laboratories required decontamination. The primary contaminants found during the decontamination efforts were Cs-137, Co-60 and Sr-90. Lab 315 had several small areas which required decontamination (~ 1 ft^2). These areas were decontaminated to levels below the guideline limits. The decontamination efforts in rooms 1 and 2 of lab 309 involved removal of the drain pipe (capped off after removal of an underground tank in 1984), removal of contaminated concrete from the floor and walls (until residual contamination was below the guidelines) and removal of ~375 ft^3 of contaminated soil, drain pipes and concrete. Soil was removed until the residual met the criteria approved by the U. S. Nuclear Regulatory Commission (NRC) and endorsed by the Department of Health Services for application at GA's site. These criteria for releasing soil to unrestricted use are summarized in Tables 2 and 3 (Attachments 6C and 6D). Soil samples (including composite samples) were taken in every exposed location after clean up in order to demonstrate compliance with the soil criteria.

GA has decontaminated these laboratories consistent with the State of California's and U. S. Nuclear Regulatory Commission's guidelines for Release of Facilities and Equipment to Unrestricted Use. The results of the final radiation and contamination surveys are included in this report to demonstrate compliance with the guidelines. The results of the analyses of soil samples (collected after cleanup) are also included in this report to demonstrate compliance with the soil target criteria.

SITE DESCRIPTION

The location of Building 2 with respect to other facilities on the GA Site is shown in Attachment 3. A layout of Building 2 is shown in Attachment 4. The building is divided into three Laboratory sections; Laboratory B, C, and A. Laboratory B includes offices and laboratories from 102 through 243. Laboratory C includes offices and laboratories from 300 through 445 and Laboratory A includes offices and laboratories from 502 through 651. The laboratories to be released to unrestricted use (Lab 315 and Rooms 1 and 2 of Lab 309) in "Addendum to Group 3" are located in the Laboratory C section (see Attachment 5).

Labs 307 and 309 were combined labs consisting of four (4) rooms (See Attachment 2) which were frequently referred to as one laboratory, namely Laboratory 307. In this report rooms 1, 2 and 3 are referred to as Lab 309 rooms 1, 2 and 3 and room 4 is Lab 307 (See Attachments 5 and 8). Both labs 307 and 309 had drain lines connected to an underground storage tank located outside of the building which was usually referred to as the "L 307 tank". The "L 307 tank" and surrounding contaminated soil were removed in 1984. The drain line from the tank to Labs 307 and 309 were capped off (see Attachment 8) when the tank was removed. A report documenting this effort was submitted to the NRC on November 30, 1984 (Reference 3) along with a request to back fill the hole resulting from the removal of the tank.

Laboratories 307/309 had been cleaned (including sandblasting) initially in ~1978. Subsequent radiation levels were greatly reduced but did not meet the limits for release to unrestricted use. In February 1989, the drain line to the laboratory was removed and decontamination efforts to release labs 307 and 309 to unrestricted use began. Labs 307 and 309 occupy an area of approximately 1150 ft^2. In addition, Room 311A (~100 ft^2) which was also used during the same time frame may also have to be decontaminated at a later date. This report covers rooms 1 and 2 of lab 309 having an area of about 620 ft^2. The rest of the area consists of room 3 of lab 309, room lab 307, and room 311A which have a total area of about 630 (including the 100 ft^2 area of room 311A).

TARGET CRITERIA FOR RELEASE TO UNRESTRICTED USE

The following criteria have been approved by the NRC and the State of California for the GA site.

FACILITY AND EQUIPMENT

Table I (Attachment 6A) is taken from USNRC's criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into our SNM-696 license. The State of California's limits for release of facilities and equipment to unrestricted use are identical to these limits for the radionuclides of concern (predominantly Cs-137, Sr-90 and Co-60). These guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," are also known as "DECON-1" are summarized in Table I (Attachment 6B). GA has decontaminated the laboratories to levels below these guidelines.

SOIL CRITERIA

The criteria for soil decontamination is given in Tables 2 and 3 (Attachments 6C and 6D, respectively). These criteria have been previously approved by the NRC for use at the GA site and were approved by the Department of Health Services. Table 3 (Attachment 6D) provides soil concentrations in pCi/g which if residing on the surface and inhaled would not lead to an exposure exceeding the target criteria in Table 2 (Attachment 6C).

Soil exposed during and after removal of the drain pipes in lab 309 was analyzed by gamma spectroscopy to determine the various radionuclides and radioactive concentrations of each. Wet chemistry was also performed on selected soil samples to determine the Sr-90 soil concentrations. If the levels were above the soil criteria summarized in Table 3 (Attachment 6D), soil was removed until these levels were met.

INSTRUMENTATION AND MEASUREMENT LIMITS FOR RELEASE

Instrumentation

1. Beta/gamma counters - Model TBM-28 and Model TBM-15 geiger counters manufactured by Technical Associates were used to survey surfaces for beta/gamma contamination. The instruments contain a pancake Geiger-Mueller (GM) detector which has a window thickness of less than 7 mg/cm^2. The instrument has three ranges covering from 0-50,000 counts per minute (cpm). The instruments are calibrated semiannually using a Cs-137 standard or a pulser.

2. Gamma Detectors - Model 19 microR meters with NaI scintillation detectors manufactured by Ludlum Measurements Inc. were used in all locations. The instrument has three ranges from 0 - 5 mR/hr. The microR meters are normally returned to the manufacturer for calibration annually. Gamma spectral analysis on selected samples were performed using a high purity germanium detector manufactured by Canberra Industries, Inc.

3. Low level Alpha/Beta counting systems manufactured by Canberra were used to analyze wipe samples.

The alpha/beta systems and the germanium detector system has been calibrated for various types of samples. This calibration is checked on a daily or weekly basis depending on usage.

Measurement Limits for Release

The final survey results have been converted from cpm (counts per minute) for a particular detector to dpm/100 cm^2. Detector "background" cpm are subtracted from measured readings. The values are then corrected for efficiency and geometric factors associated with the instrumentation.

1. Background

A "standard" natural background was determined for each instrument and subtracted from the survey readings. The surface beta/gamma readings were completed using the TBM Model 28 and Model 15 GM counters which have a background concrete reading of about 80 plus or minus 20 counts per minute.

2. Efficiency

NBS traceable standards were used to calibrate instruments for various efficiencies. The standards consist of concrete blocks (one for each radionuclide) having an area of approximately 25 cm x 25 cm spiked with an NBS traceable standard liquid solution of the specific radionuclide i.e. Cs-137, 93% enriched uranium, depleted uranium and thorium. The maximum allowable level is 15,000 dpm for an area less than 100 cm^2 and the average allowable level for an area 1 meter by 1 meter or less is 5000 dpm/100 cm^2 (Attachments 6A and 6B). Surface measurements of the blocks were obtained with the instruments and percent efficiencies were obtained. The readings were corrected for efficiency by multiplying by the appropriate correction factor.

3. Geometry Correction

The acceptable values listed in Table 1 are in dpm/100 cm^2, therefore, a correction factor was applied to the measured values to correct for the smaller area of the detector. The Model TBM-28 and Model TBM-15 (geiger counters) have a 5 cm diameter detector which measures a 19.6 cm^2 area. The reading is therefore corrected by multiplying by 5.1. The alpha detectors used for the surveys "see", at any given time, an area of about 78.7 cm^2, which then requires a correction factor of 1.27.

PREVIOUS LABORATORY ACTIVITIES

A brief description of the previous use of these laboratories over the past approximately 20 years is provided below. Information is also provided below on the work involved in cleaning these labs and the results of initial surveys of these laboratories.

Laboratory 315 (No mezzanine)

Previous History

In the early 1970's, various experiments involving the use of fission products as tracers for kinetic and thermodynamic properties of high temperature materials were conducted in these laboratories. In addition, Cs-137, I-131, Ag-110 and Te-127 were used for thermal adsorbtion studies (Work Authorizations #2000, 2059, and 2073).

1989 Decontamination Effort

Surveys using geiger counters and microR meters showed no contamination on the floor (tiled) or walls of the laboratory.

Several small areas were identified by ORAU as needing additional cleanup (below tile floor and wall) during the confirmatory survey completed March 14-24, 1989. ORAU re-surveyed the areas after GA decontaminated them and found the levels to be below the release criteria (Reference 2).

Rooms 1 and 2 of Laboratory 309 (No Mezzanine)

Previous History

The Work Authorization records seemed to refer to these two laboratories as Lab 307. For this reason, all Work Authorizations referring to "lab 307" are assumed to be for lab 309 also.

Work Authorization #1459 was approved in August 1969 to allow the possession of 50 grams of depleted uranium for "parting discs of UC_2 with a diamond wire saw". In 1970, the possession limit was increased to 300 grams U-238.

Work continued until ~4/77 in these labs under several different Work Authorizations. WA's #1882 and #1967, approved 8/15/72, authorized the cutting of Peach Bottom spine elements to begin diffusion experiments. WA #1983, approved 10/1/73, covered all fuel chemistry branch work requiring

Special Nuclear Material (SNM) and other radioactive materials. WA #2021, issued 4/24/74, allowed both SNM and non-SNM to be used for chemical and instrumental analyses on materials. WA's #1907 and 2023, approved ~5/73, authorized mixed fission products and U-235 to perform post irradiation analysis of irradiated fuels (UO_2, UO_2/ThO_2, UC_2) of various U-235 enrichments. WA #2029 was issued to conduct analysis of Peach Bottom fuel elements and HTGR core materials. WA #2033, approved 8/29/74, to irradiate UO_2 in pellet form in stainless steel cans and examine segments of fuel cladding and structural components for fission gas and tritium analysis at TRIGA and Hot Cell. WA #2061 authorized autoradiography of irradiated fuel bodies and WA's #2051, #2091, and #2166 authorized miscellaneous measurements of specimens (irradiated carbon, silicon carbide, etc.) until 4/15/77. The records do not show any other WA's issued for these laboratories beyond 4/15/77.

1977 Decontamination Effort

In 1977, decontamination of the laboratories began (information was obtained from Health Physics Log Book #7467). Rooms 1 and 2 were decontaminated (including sandblasting) from relatively high radiation levels to low radiation levels. The rooms were completely emptied, room 2 was retiled, the drains were plugged (some with lead and cement "patches"), and the drain lines were tagged with "Caution Radioactive Materials" labels. The labels on the drain lines identified the Health Physics log book which documented this effort. The radiation levels after the rooms were cleaned constitute the "Initial Survey". Some of this information is presented in Attachment 9.

1989 Decontamination Effort

In room 1 (~350 ft^2), the concrete floor areas represent about 318 ft^2; the rest of the floor area (about 32 ft^2) are soil trenches resulting from the removal of the underground drain pipes. ORAU identified an area of the floor along the southeast wall which needed additional cleanup. GA removed a segment of concrete and disposed of it as radioactive waste. Subsequent surveys by the ORAU team showed levels were below the guidelines.

In room 2 (~270 ft^2), the new tile installed after the original cleanup in 1977 was removed. The concrete was also completely removed from the floor surface. The underground drain pipes were then removed. The highest radiation level noted on the pipes was ~8 mR/hour beta/gamma. Trenches were formed by the removal of the pipe shown as the dotted areas in Attachments 10-13. Contaminated soil was detected using microR meters and geiger counters. The drain pipes and the soil below the drain pipes were removed and disposed of as radioactive waste.

Surface soil samples were collected from each area exposed. Samples were dried to remove moisture and then analyzed by gamma ray spectroscopy using a high purity germanium detector system in accordance with written procedures. All gamma emitting radionuclides were identified and their concentrations were determined. The Th-232 value was obtained based on the concentrations of the daughter radionuclides. Th-232 was assumed to be in equilibrium with its daughters. Wet chemistry was also performed on selected soil samples to determine the Sr-90 soil concentrations. Results of the soil samples showed predominantly Cs-137, Co-60 and Sr-90 contamination (the pipe had rusted through resulting in soil contamination). The locations of the initial soil samples are provided in Attachment 10 and Attachment 11 provides the results. A few of these locations had soil contaminated to levels which exceeded the release criteria described in Tables 2 and 3 (Attachments 6C and 6D, respectively). In these areas, soil was removed until the approved levels were met.

Final soil samples were collected in all areas where additional cleanup was conducted. Individual soil samples as well as composite soil samples were collected. The locations of the samples are shown in Attachments 12 and 13. The results of these samples are shown in Attachment 14. No additional soil samples were collected in those areas where the initial soil sample result did not exceed the soil release criteria. A total of ~ 375 ft^3 of soil was removed during the cleanup stage representing about fifty (50) 55 gallon drums of contaminated soil; three of the 55 gallon drums of soil (~22 ft^3) were removed during ORAU's visit after analysis of a sample collected in the "pit intersection" (see Attachment 12 for location) by ORAU and split with GA showed some Co-60. Although the levels would have met the guidelines (because it is an area less than 30' by 30'), additional soil was removed to reduce the levels (see Attachment 14 for results). Subsequent samples collected in this area by ORAU and split with GA were also analyzed immediately in the Health Physics Laboratory. These results (Attachment 14) showed contamination levels were well below the target criteria provided in Table 3 (Attachment 6D). All other samples split with the ORAU during their visit were also analyzed and found to be well within the target criteria.

K. Wong representing the State of California also collected soil samples in the "pit intersection" area subsequent to the above described removal of additional soil. These samples were also split with GA. GA counted the samples in the Health Physics Laboratory. The results (provided in Attachment 14) showed levels were below the soil criteria concentrations for release to unrestricted use.

During ORAU's survey of this room, some spots were found on the walls. These spots were decontaminated immediately and re-surveyed by ORAU. Levels after additional decontamination were below the guidelines for release to unrestricted use (Reference 2).

FINAL RADIATION SURVEYS

Final surveys of Lab 315 and Rooms 1 and 2 of Lab 309 were conducted using the Model TBM-28 and Model TBM-15 geiger counters. The measurements of average contamination were averaged over 1 meter^2 and are given in dpm/100 cm^2. The maximum contamination level applies to an area of not more than 100 cm^2. Attachment 7 provides the final survey of lab 315.

Rooms 1 and 2 of lab 309 were surveyed primarily during the ORAU visit. Areas requiring additional cleanup as identified by ORAU were decontaminated by GA personnel. Levels after additional decontamination were below the guidelines for release to unrestricted use (Reference 2).

A microR meter was also used to survey the laboratories and to measure floor radiation levels. Radiation levels in Lab 315 were at normal background levels (see Attachment 7). Radiation levels on the soil surfaces in Rooms 1 and 2 of Lab 309 were less than 30 microR/hour after removal of the contaminated soil. Levels below this indicate that soil radionuclide concentrations for the radionuclides of concern are below the soil target criteria.

FINAL CONTAMINATION SURVEYS

Table 1 (Attachments 6A and 6B) provides limits for acceptable removable surface contamination levels. Contamination surveys (wipes) were conducted although no removable contamination was suspected i.e. the labs had not been used for several years. The wipes were collected on the floors of Lab 315. The wipe sample locations are shown in Attachments 7 and the results are shown in Attachment 15.

The contamination levels in every location were < 20 dpm/100 cm^2 area, and well below the Table 1 limits (Attachments 6A and 6B) for removable contamination.

COMPLIANCE WITH THE TARGET CRITERIA

Facilities and Equipment

All floors, walls and concrete surfaces were decontaminated below the release levels specified in Table 1 (Attachment 6A and 6B). The final surveys provided in this report demonstrate compliance with the criteria for release to unrestricted use.

Direct Radiation

The direct radiation level at all areas of Lab 315 and Rooms 1 and 2 of Lab 309 are less than 10 microR/hr above background (at one meter above ground level). All surface radiation levels on the soil inside the trenches was less than 30 mircoR/hour after removal of the contaminated soil.

Soil Limits

The results of soil samples collected in every area after cleanup show levels are well below the target criteria specified in Table 2 and 3 (Attachments 6C and 6D).

CONCLUSION

Final surveys of Lab 315 and Rooms 1 and 2 of Lab 309 and results of final soil samples collected in Rooms 1 and 2 of Lab 309 provided in this report demonstrate that the levels meet the guidelines for release to unrestricted use.

REFERENCES

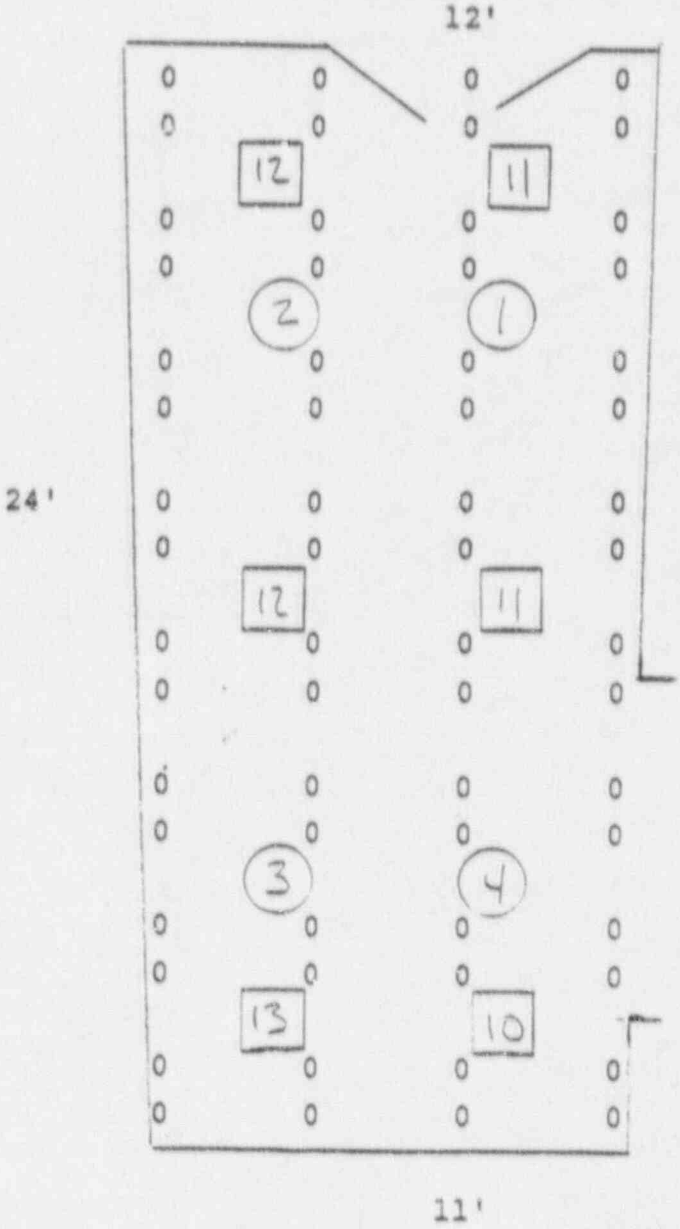
1. Asmussen, K. E., letter #696-1318 to Mr. Robert D. Thomas, "Request for Release of Selected Laboratories to Unrestricted Use (Group 3)", dated December 21, 1988.

2. Yuhas, G. P., letter dated August 18, 1989 to Mr. R. N. Rademacher, "NRC Inspection", with ORAU Report #89/F-98 identified as NRC Inspection Report No. 70-734/89-02.

3. Mowry, W. R., letter #696-6083 to Mr W. T. Crow, "Request for Approval to Backfill L-307 Pit", with report entitled "Final Report L-307 Pit at GA site" dated November 30, 1984.

ATTACHMENT 1

FINAL SURVEY OF LAB 315



FINAL SURVEY COMPLETED 2-28-89

Instruments used were: Ludlum 19 microR meter #33545 calibrated 11-11-88, and geiger counter TBM-28 #108113 calibrated 10-31-88.

1. Each unit represents a three foot by three foot area or less.
2. Top value is the average beta/gamma contamination in DPM/100 cm square in a three foot by three foot area or less.
3. Bottom value is the maximum beta/gamma contamination in DPM for an area <100 cm square.
4. Circled numbers are wipe locations.
5. Numbers in squares are measured microR/hr level.
6. No contamination requiring cleanup was detected in this lab.

ATTACHMENT 2

Draft Summary
2/27/89

Summary of the Decontamination of LABS 307/309 for release to unrestricted use

Labs 307/309 are located in the Laboratory B section of General Atomic's Building 2. These labs had drain lines connected to an underground tank called the "L-307 tank". This tank and surrounding contaminated soil were removed in 1984. The drain line from the tank to Lab 307/309 was capped off when the tank was removed.

During the past few months, the drain line to the laboratory was removed and decontamination efforts to release labs 307/309 to unrestricted use began.

These efforts are being completed in two parts. The labs (shown in the attachment) occupy an area of approximately 1150 ft^2. Part I consists of two rooms (rooms 1 and 2) having an area of about 620 ft^2. Part II (rooms 3 and 4) also consists of two rooms and has an area of about 530 ft^2.

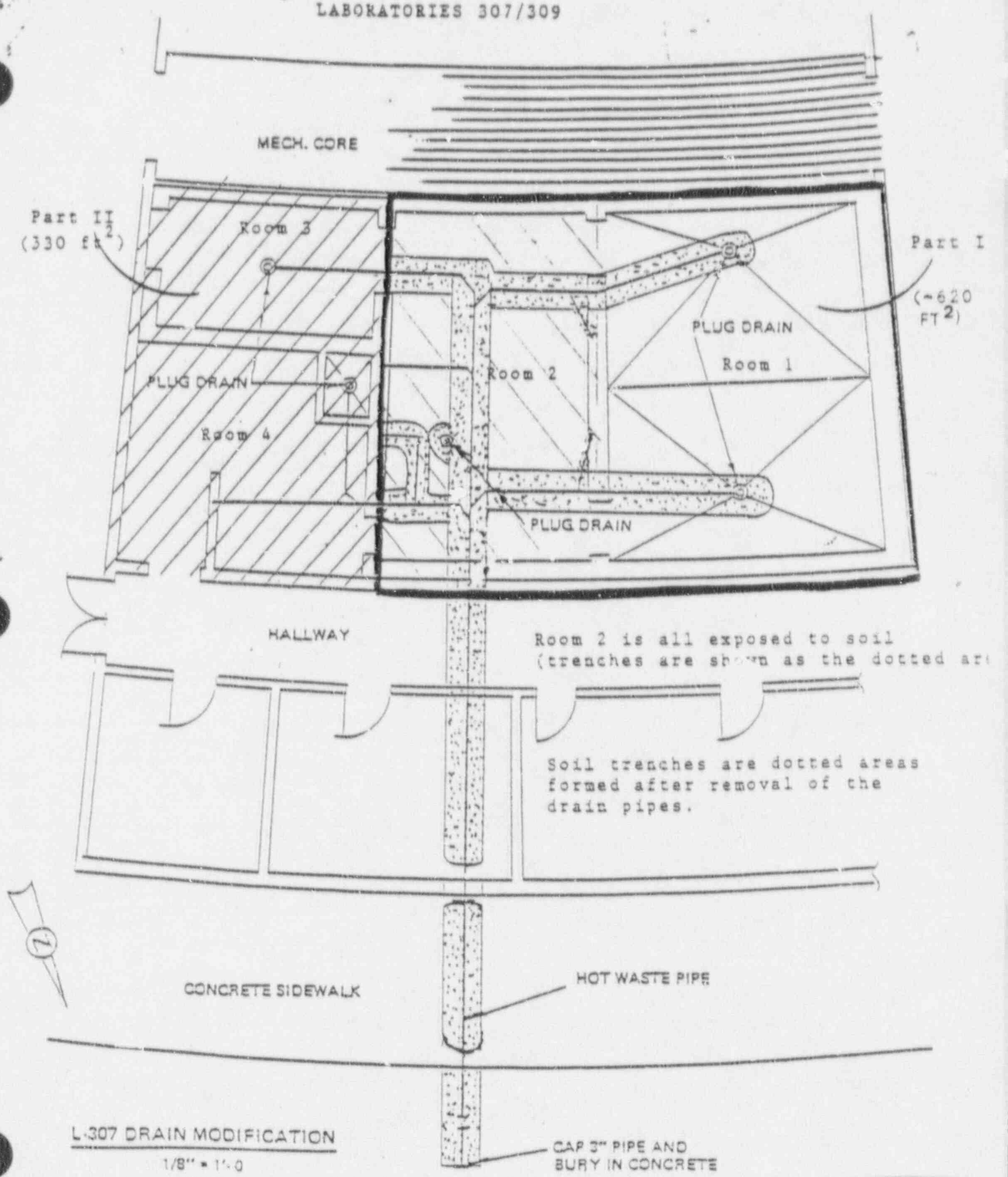
We have finished decontamination of Part I and would like a confirmatory survey completed so we can refurbish the area. Additional information is provided below:

The underground drain pipe was removed in all of the Part I areas shown in the attached drawing. A trench was formed by the removal of the pipe shown as the dotted areas in the drawing. Soil samples collected inside the rooms showed some soil contamination below the pipe (indications are that the pipe had rusted resulting in some soil contamination). The predominant radionuclides found in the soil were Cs-137, Co-60 and Sr-90. Forty-four drums (55 gallon) of soil were removed from the trenches. Confirmatory soil samples collected after removal of the soil were analyzed. Concentration values for both Cs-137 and Co-60 were found to be well below the criteria previously approved by NRC. We are awaiting final soil sample results for Sr-90 and are expecting the values to be < 100 pCi/gram. This is because samples collected before cleanup was completed were analyzed to have < 300 pCi/gram. Since the limit for Sr-90 is 1800 pCi/gram (Option 1 criteria limit for inhalation dose), we should meet the criteria. The surface radiation levels are <10 microR/hr above background at one meter.

In room 1 (~350 ft^2), the concrete floor areas which would need to be surveyed represent about 318 ft^2; the rest of the floor area (about 32 ft^2) are soil trenches). In room 2 (~270 ft^2), the concrete was removed completed from the floor surface so the entire area is exposed to soil. The soil trenches in the room are shown in the drawing.

Attachment 2 Page 2 of 2

LABORATORIES 307/309



Room 2 is all exposed to soil
(trenches are shown as the dotted ar

Soil trenches are dotted areas
formed after removal of the
drain pipes.

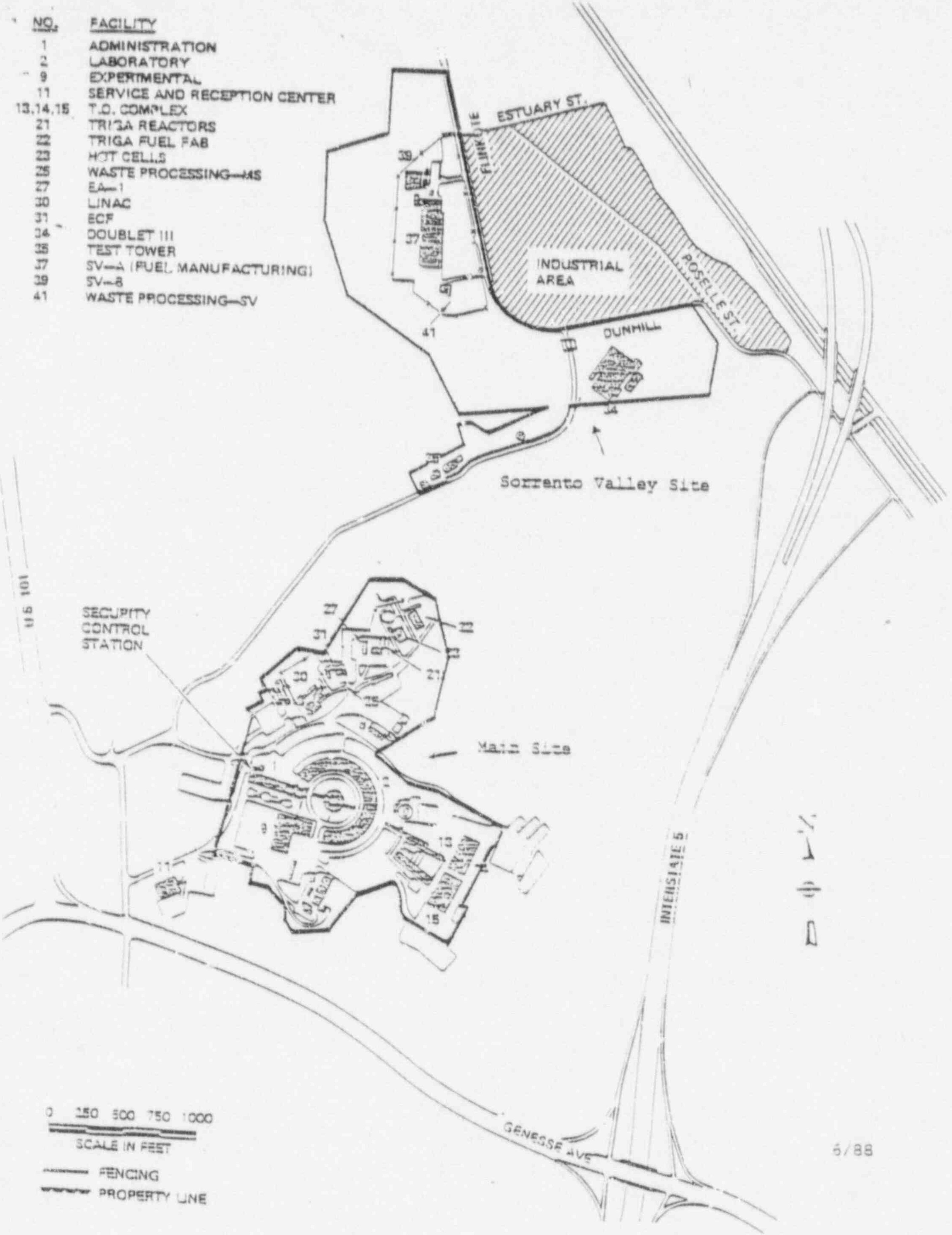
L-307 DRAIN MODIFICATION

1/8" = 1'-0

8/9/84

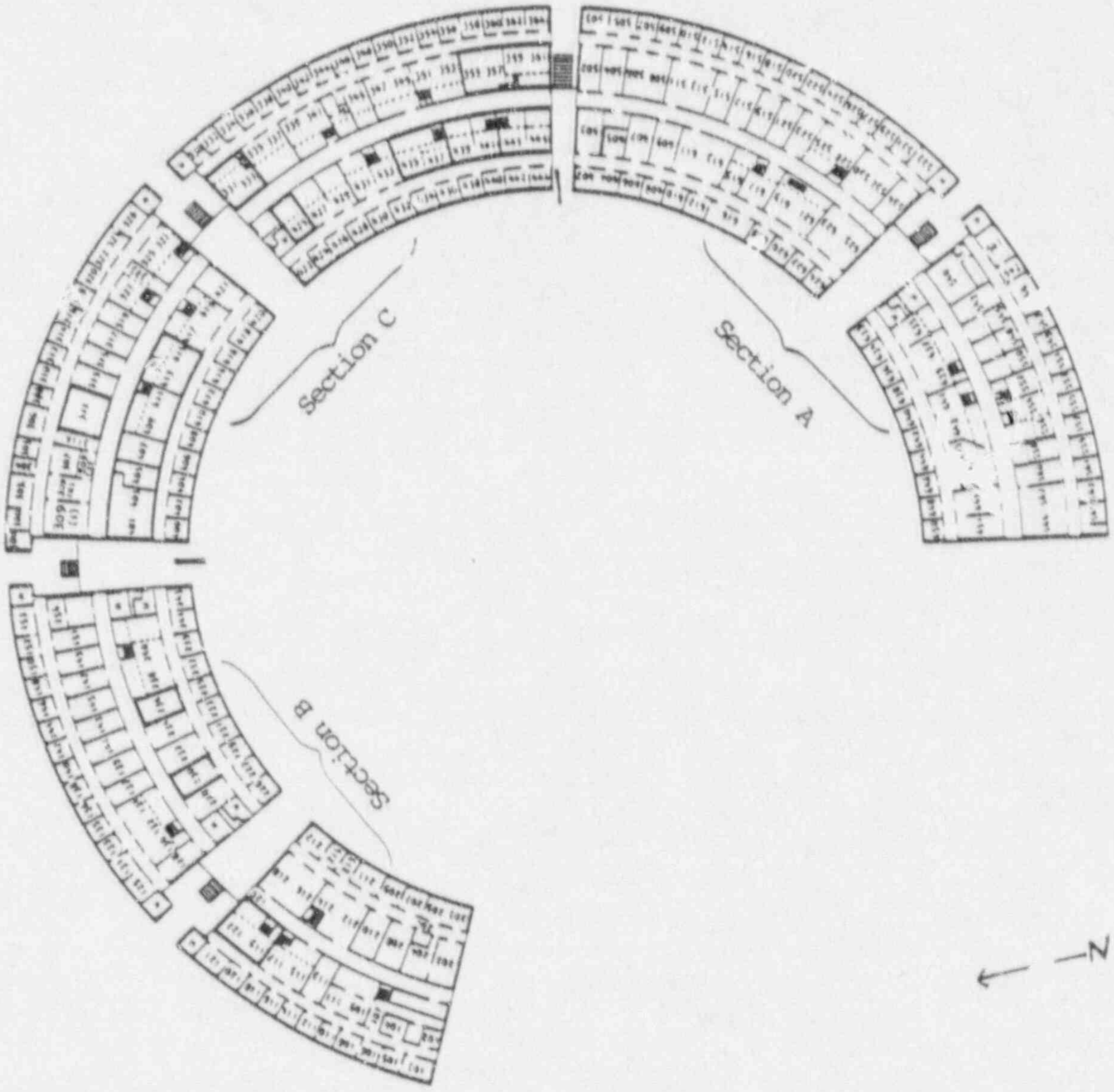
Revised 2/27/89 LQ

APPROVALS	FE	Z-22-2
F.E._____ H.P._____	SEALED CONTAMINATED PLUMBING	



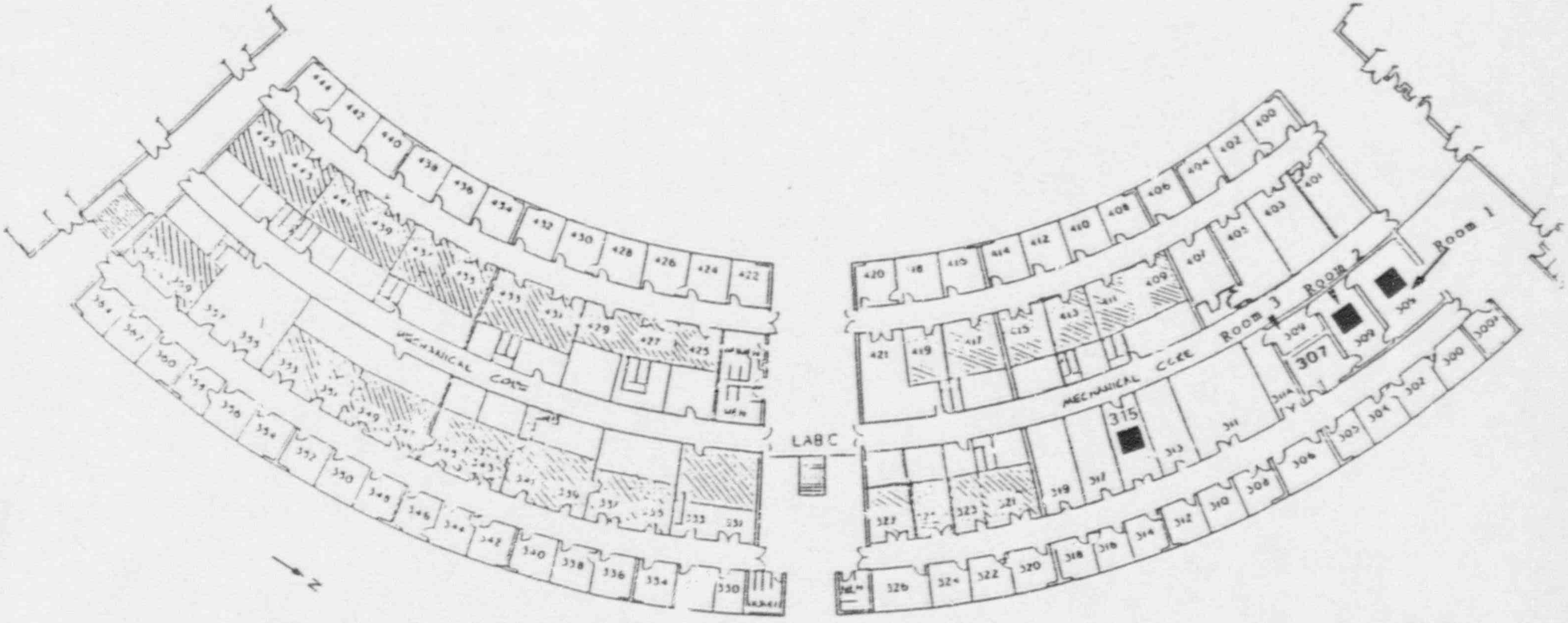
6/88

ATTACHMENT 5: Plan View of Sites



Attachment 4: L Building Complex (Building 2)

ATTACHMENT 5: SELECTED SCIENCE LABORAYORIES (ADDENDUM TO
GROUP 3) TO BE RELEASED TO UNRESTRICTED USE



LABORATORY C BUILDING 2

■ Labs to be released (addendum to group 3 labs)

ATTACHMENT 6C

TABLE 2

Criteria for Soil Decontamination at the GA Site

Exposure Pathway	Target Criteria	Other Existing Criteria or Guidance
External Radiation (whole body)	10 μr/hr (35 mrem/yr)[a]	20 μr/hr indoor[b] -EPA cleanup standard for Inactive Uranium Processing Site; 500 mrem/yr-10 CFR 20; 170 mrem/yr-FRC Guidance; 400-900 mrem/yr-Surgeon General's Guidance for indoor exposure; 25 mrem/yr-40 CFR 190.
Inhalation of Particulates (lung, bone)	1 mrad/yr (lung) (20 mrem/yr)[c] 3 mrad/yr (bone) (60 mrem/yr)	1500 mrem/yr-10 CFR 20[d] 25 mrem/yr-40 CFR 190 1 mrad/yr (lung), 3mrad (bone) EPA Transuranic Guidance

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[a] This value does not include background, the 35 mrem/yr (realistic dose) includes shielding factor of 0.5 from building a residential home for general population and residence time 80 percent.

[b] 40 CFR Part 192 - Federal Register, April 22, 1980.

[c] Based on quality factor of 20 as originally intended for alpha emitted from the transuranic elements.

[d] Designated in or derived from 10 CFR 20.

ATTACHMENT 6D

TABLE 3

Individual Concentration in Soil Resulting in an Annual Inhalation Dose of 20 mrem to the Lung(1) and 60 mrem to the Bone(2)

Radionuclide	Solubility Classification	Derived Concentration (pCi/g)	
		Lung (20 mrem/yr)	Bone (60 mrem/yr)
U-238	Y	35	1.2×10^{4}
U-238	W	3.2×10^{2}	3.9×10^{3}
U-238	D	1.9×10^{4}	1.2×10^{3}
U-235	Y	35	1.2×10^{4}
U-235	W	3.2×10^{2}	3.9×10^{3}
U-235	D	1.9×10^{4}	1.2×10^{3}
U-234	Y	30	1.0×10^{4}
U-234	W	2.8×10^{2}	3.6×10^{3}
U-234	D	1.7×10^{4}	1.1×10^{3}
Th-232	Y	35	2.6×10
Th-232	W	3.3×10^{2}	1.0×10^{2}
Ra-228	W	3.3×10^{3}	2.9×10^{3}
Th-228[3]	Y	20	1.8×10^{3}
Th-228	W	1.3×10^{2}	3.3×10^{2}
Co-60[4]	Y	1.2×10^{4}	1.6×10^{6}
Co-60	W	1.2×10^{5}	5.8×10^{6}
Cs-137[4]	D	9.6×10^{5}	1.8×10^{6}
Sr-90[4]	Y	1.8×10^{3}	2.6×10^{5}
Sr-90	D	1.6×10^{6}	2.8×10^{4}

---

(1) Pulmonary lung (570 gm); consistent with EPA's Transuranic Guidance.

(2) Bone means osseous tissue (5,000 gm); consistent with EPA's Transuranic Guidance.

(3) The daughters of Th-228 and Ac-228 do not contribute significantly to the inhalation dose because of their comparatively short half-lives.

(4) Solubility classifications are based on ICRP-30.

ATTACHMENT 6A

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES[a]	AVERAGE[b c f]	MAXIMUM[b d f]	REMOVABLE[b e f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm $\alpha/100\ cm^2$	15,000 dpm $\alpha/100\ cm^2$	1,000 dpm $\alpha/100\ cm^2$
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	1 [illegible]pm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126 I-131, I-133	1600 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta\gamma/100\ cm^2$	15,000 dpm $\beta\gamma/100\ cm^2$	1000 dpm $\beta\gamma/100\ cm^2$

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

ATTACHMENT 6B

TABLE I
ACCEPTABLE SURFACE CONTAMINATION LEVELS[1]/[2]/

NUCLIDE[a]	AVERAGE[b] [c] (dpm/100 cm^2)	MAXIMUM[b] [d] (dpm/100 cm^2)	REMOVABLE[b] (dpm/100 cm^2)
a) U-nat, U-235, U-238, and associated decay products	5,000	15,000	1,000
b) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231 Ac-227, I-125, I-129	100	300	20
c) Th-nat, Th-232, Sr-90 Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
d) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
e) H-3, C-14 except as DNA precursors f/	20,000	60,000	4,000

Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the li established for alpha- and beta-gamma-emitting nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioacti material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm^2.

The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of know efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

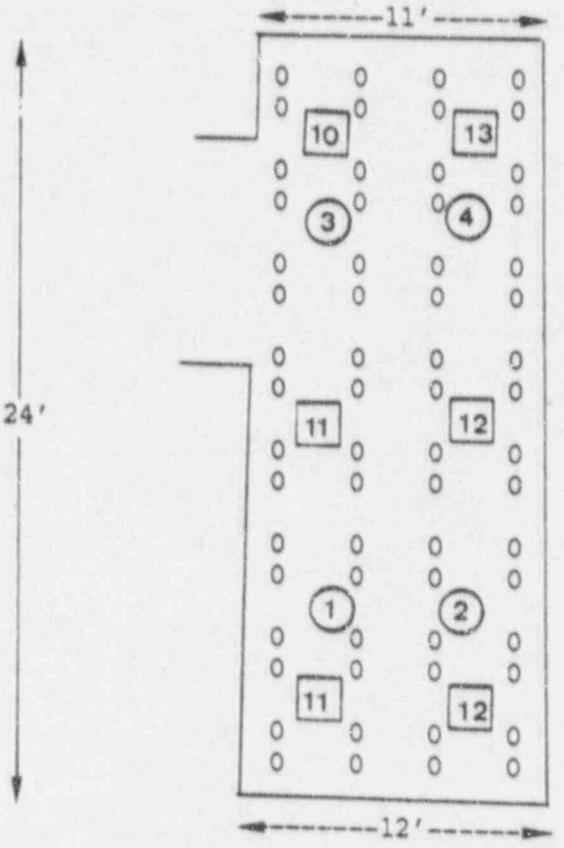
DNA precursors mean molecules or compounds that are directly incorporated into the DNA molecule during DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and nucleosides. The acceptable surface contamination levels for H-3 and C-14 in DNA precursors are as tabulated in paragraph (d) for beta-gamma-emitters.

USNRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, Wash D.C. (June 1974)

ANSI, Control of Radioactive Surface Contamination on Materials, Equipment and Facilities To Be Released for Uncontrolled Use, final draft, proposed American National Standard N-328, Atomic Industrial Forum, Inc., N.Y. (June 1974)

ATTACHMENT 7

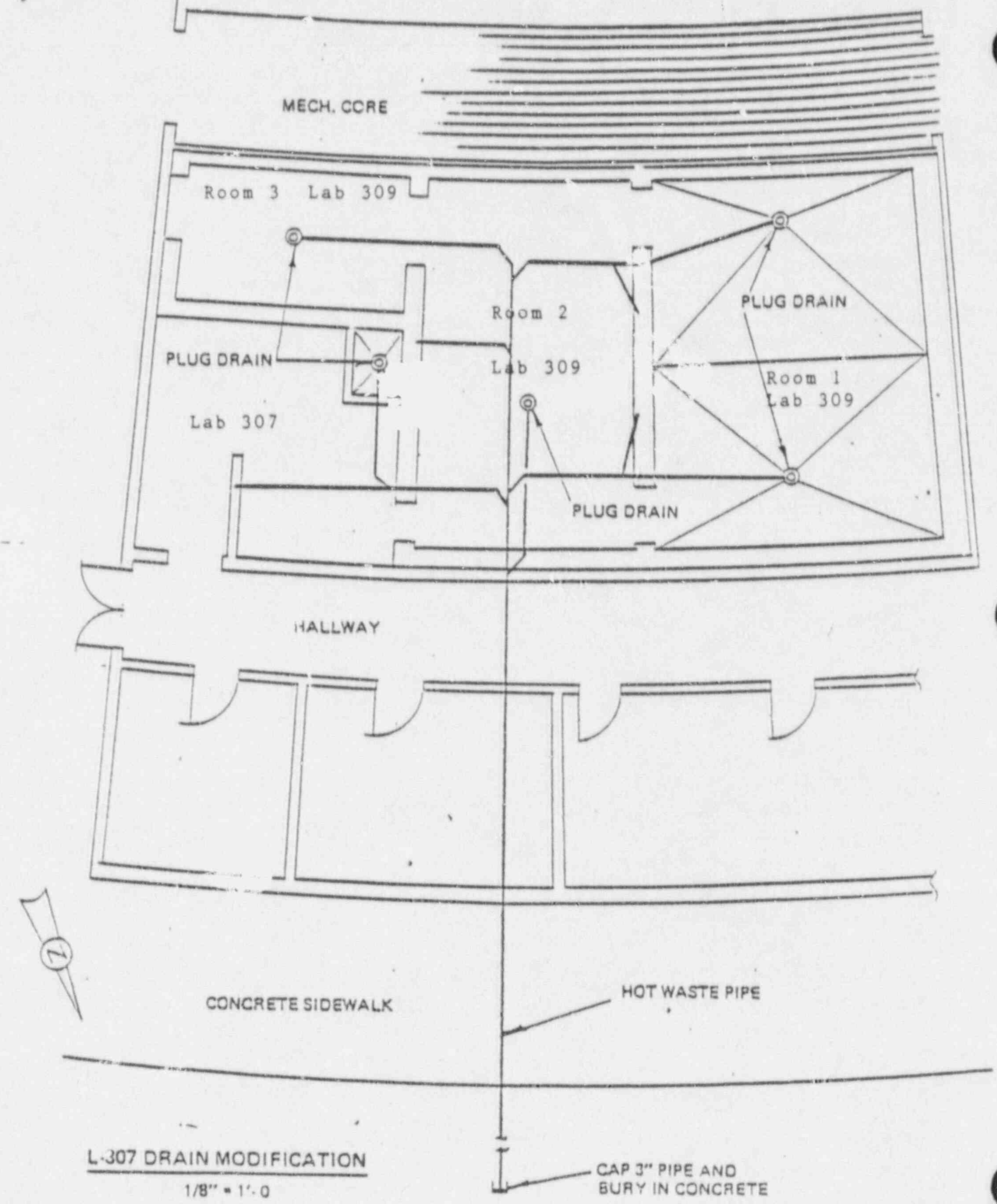
FINAL SURVEY OF LAB 315



Notes:

1. Final survey completed February 28, 1989 using geiger counter TBM-28 #108113 calibrated October 31, 1988 and Model 19 microR meter #33545, calibrated November 11, 1988.
2. Each unit represents a three foot by three foot area or less.
3. Top value is the average beta/gamma contamination in DPM/100 cm^2 in a three foot by three foot area or less.
4. Bottom value is the maximum beta/gamma contamination in DPM for an area less than 100 cm^2.
5. Circled numbers are wipe locations.
6. Numbers in squares are measured microR/hr radiation levels.
7. During the ORAU survey, some contamination was detected on several small areas of the floor and wall. The small areas (a total of about 1 ft^2 in area) were decontaminated to background levels.

ATTACHMENT 8: DRAWING SHOWING LAB 309 ROOMS AND LAB 307



L-307 DRAIN MODIFICATION

1/8" = 1'-0
8/9/84

APPROVALS	FE	Z-22-2
F.E.______ H.P.______	SEALED CONTAMINATED PLUMBING	

ATTACHMENT 11

INITIAL SOIL SAMPLE RESULTS

LAB 309

Radionuclide Concentration (pCi/g)

Sample ID #	Co-60	Ba-133	Cs-137	Eu-154	Th-228	Ra-226	Ra-228	U-238	U-235	Sr-90
(SEE ATTACHMENT 10 FOR SOIL SAMPLE LOCATIONS)										
Plug	ND	ND	0.14 ± 0.01	0.20 ± 0.01	0.80 ± 0.30	0.60 ± 0.02	0.90 ± 0.05	1.70 ± 0.10	0.05 ± 0.03	
Sidewalk	0.27 ± 0.03	ND	2.70 ± 0.07	ND	0.50 ± 0.07	0.33 ± 0.04	0.50 ± 0.07	0.90 ± 0.20	0.06 ± 0.01	
302 Office	1.90 ± 0.04	0.50 ± 0.04	14.70 ± 0.08	1.70 ± 0.09	1.10 ± 0.30	0.70 ± 0.04	1.20 ± 0.10	2.00 ± 0.20	0.17 ± 0.03	240
Hallway	2.20 ± 0.10	ND	1.40 ± 0.08	ND	1.40 ± 0.10	0.80 ± 0.90	1.50 ± 0.20	ND	0.10 ± 0.04	
Under Wall	3.10 ± 0.20	ND	15.40 ± 0.30	1.50 ± 0.30	1.20 ± 0.20	0.50 ± 0.10	1.50 ± 0.50	ND	0.20 ± 0.10	<5
A	ND	ND	ND	ND	0.94 ± 0.20	0.60 ± 0.07	ND	ND	ND	
B	ND	ND	3.20 ± 0.10	ND	0.80 ± 0.10	0.50 ± 0.09	1.60 ± 0.20	1.70 ± 0.40	ND	
C	1.30 ± 0.10	0.30 ± 0.07	0.67 ± 0.07	ND	1.30 ± 0.10	0.70 ± 0.10	1.30 ± 0.30	ND	0.10 ± 0.05	
D	0.50 ± 0.10	ND	30.98 ± 0.50	ND	1.10 ± 0.20	0.80 ± 0.20	1.10 ± 0.20	ND	ND	
E	0.90 ± 0.04	ND	0.35 ± 0.03	ND	0.80 ± 0.07	0.50 ± 0.05	0.80 ± 0.10	ND	0.09 ± 0.02	
F	0.20 ± 0.04	ND	0.18 ± 0.03	ND	1.00 ± 0.15	0.60 ± 0.07	0.90 ± 0.20	1.70 ± 0.04	0.10 ± 0.30	
G	5.40 ± 0.10	ND	13.00 ± 0.10	0.80 ± 0.30	0.98 ± 0.10	0.50 ± 0.07	0.90 ± 0.10	ND	0.10 ± 0.05	
H	0.20 ± 0.03	ND	0.30 ± 0.04	ND	0.60 ± 0.10	0.30 ± 0.05	0.60 ± 0.10	1.0 ± 0.30	0.06 ± 0.03	39
I	1.90 ± 0.10	ND	1.00 ± 0.07	ND	1.40 ± 0.10	0.90 ± 0.10	1.40 ± 0.20	2.2 ± 0.50	0.17 ± 0.04	
J	ND	ND	0.10 ± 0.02	ND	1.30 ± 0.07	0.90 ± 0.06	1.40 ± 0.10	2.60 ± 0.30	0.25 ± 0.03	

ATTACHMENT 11

INITIAL SOIL SAMPLE RESULTS

LAB 309

Radionuclide Concentration (pCi/g)

Sample ID #	Co-60	Ba-133	Cs-137	Eu-154	Th-228	Ra-226	Ra-228	U-238	U-235	Sr-90
K	ND	ND	0.23 ± 0.02	ND	0.60 ± 0.06	0.40 ± 0.04	0.70 ± 0.10	1.10 ± 0.20	0.08 ± 0.02	
L	ND	ND	1.79 ± 0.06	ND	0.70 ± 0.10	0.70 ± 0.10	0.70 ± 0.10	1.40 ± 0.20	0.07 ± 0.02	
M	ND	ND	0.20 ± 0.04	ND	1.40 ± 0.10	0.90 ± 0.10	1.30 ± 0.20	1.80 ± 0.40	0.11 ± 0.03	
N	ND	ND	ND	ND	1.40 ± 0.10	0.70 ± 0.05	1.30 ± 0.10	2.00 ± 0.30	0.12 ± 0.02	
O	0.50 ± 0.01	ND	0.83 ± 0.02	ND	0.90 ± 0.03	0.60 ± 0.02	0.90 ± 0.05	1.30 ± 0.10	0.09 ± 0.01	

Note: ND = Not Detectable Means:

Cs-137 = <0.1 pCi/gram

Co-60 = <0.1 pCi/gram

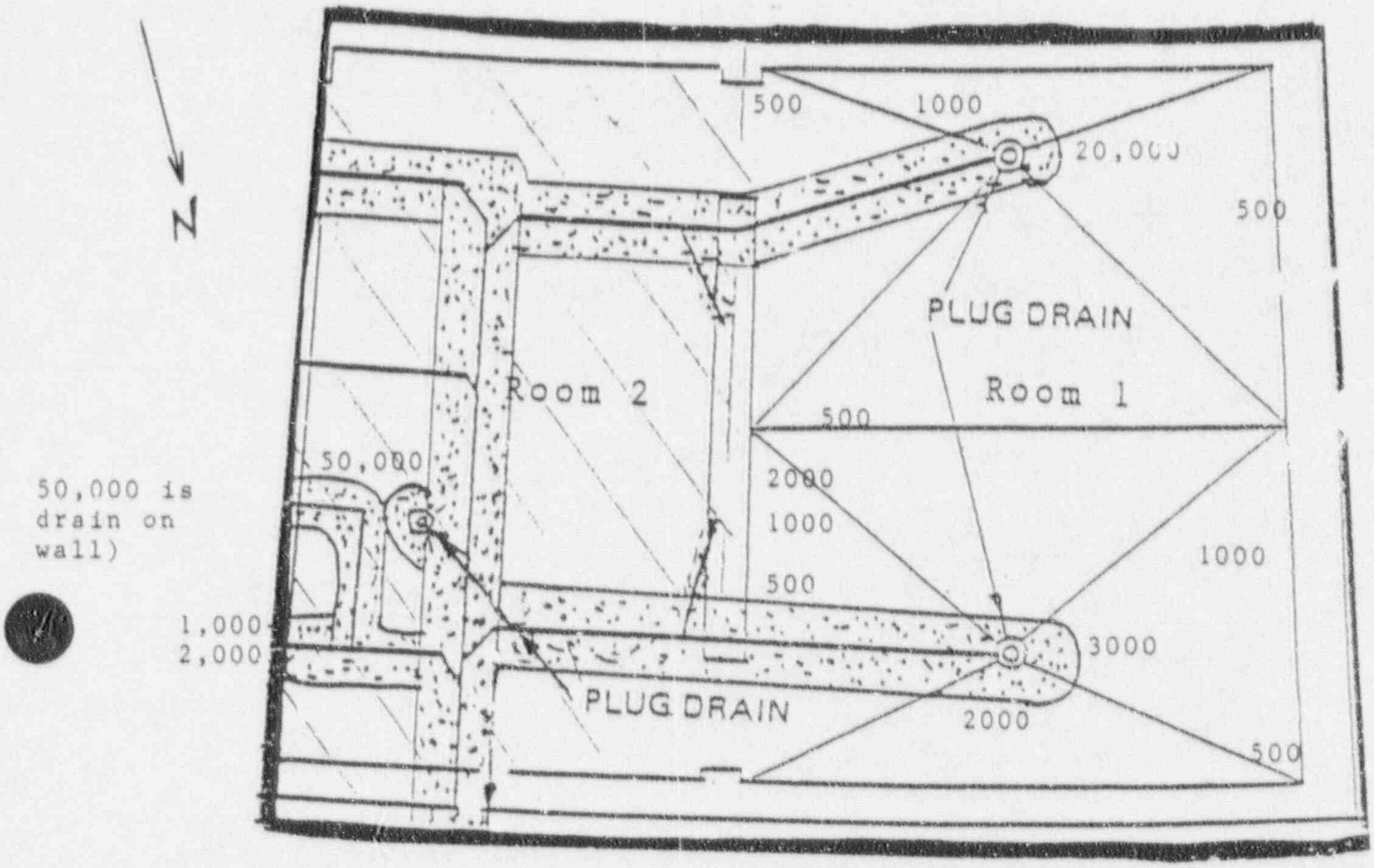
Ba-133 = <0.1 pCi/gram

Eu-154 = <0.1 pCi/gram

U-238 = <3.0 pCi/gram

U-235 = <0.1 pCi/gram

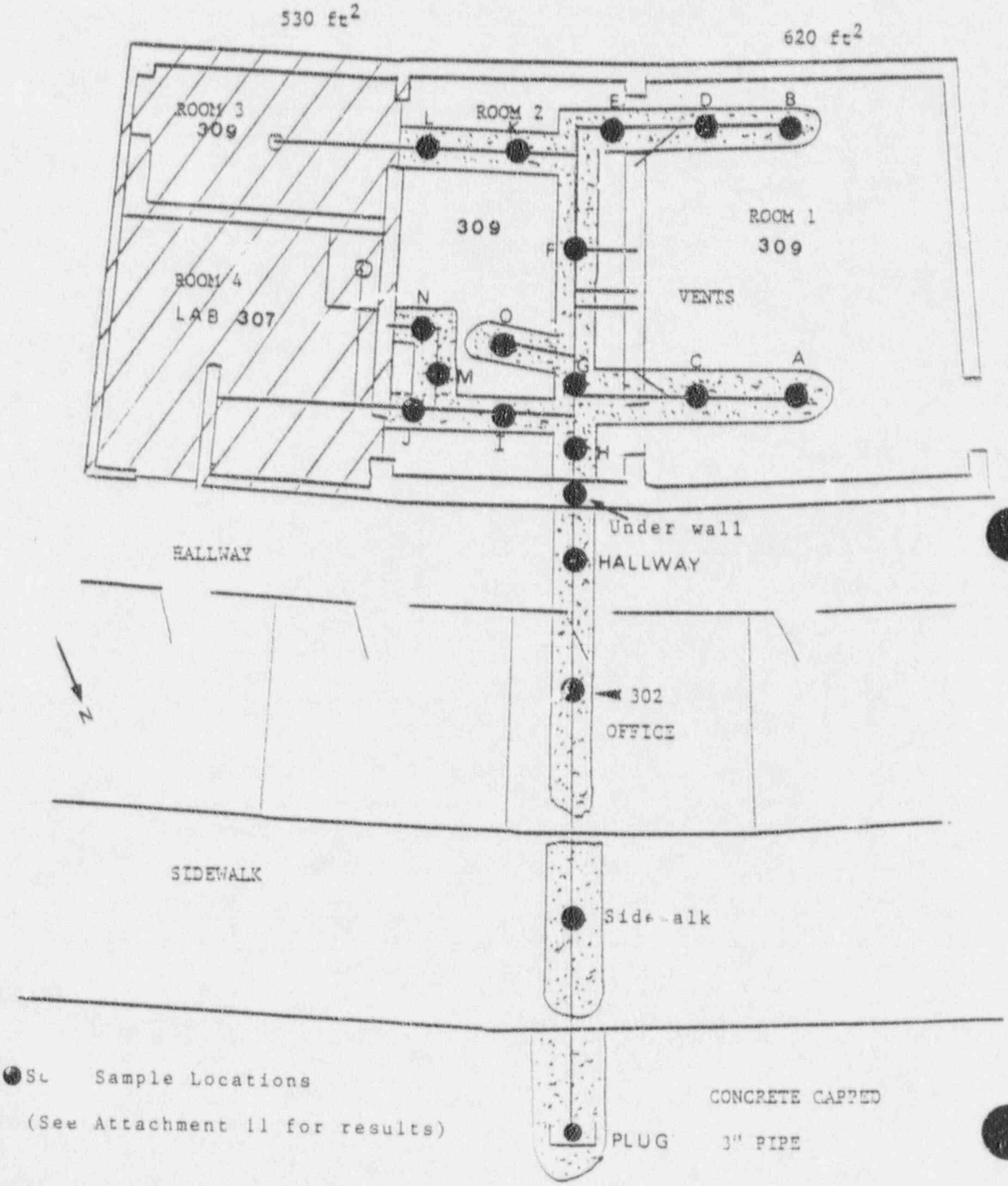
Attachment 9: Initial Survey of Rooms 1 & 2 of Lab 309



NOTES:

1. Initial survey completed 10/77 (Log Book #7467).
2. Values are counts per minute (cpm) beta/gamma radiation levels using a geiger counter.
3. Room 2 was re-tiled after initial decontamination in 1977. Clean tile was removed in 1989. Concrete, drain pipes and contaminated soil were removed in 1989.
4. Room 1 has concrete surface except where trenches were formed as a result of removal of underground drain pipes.

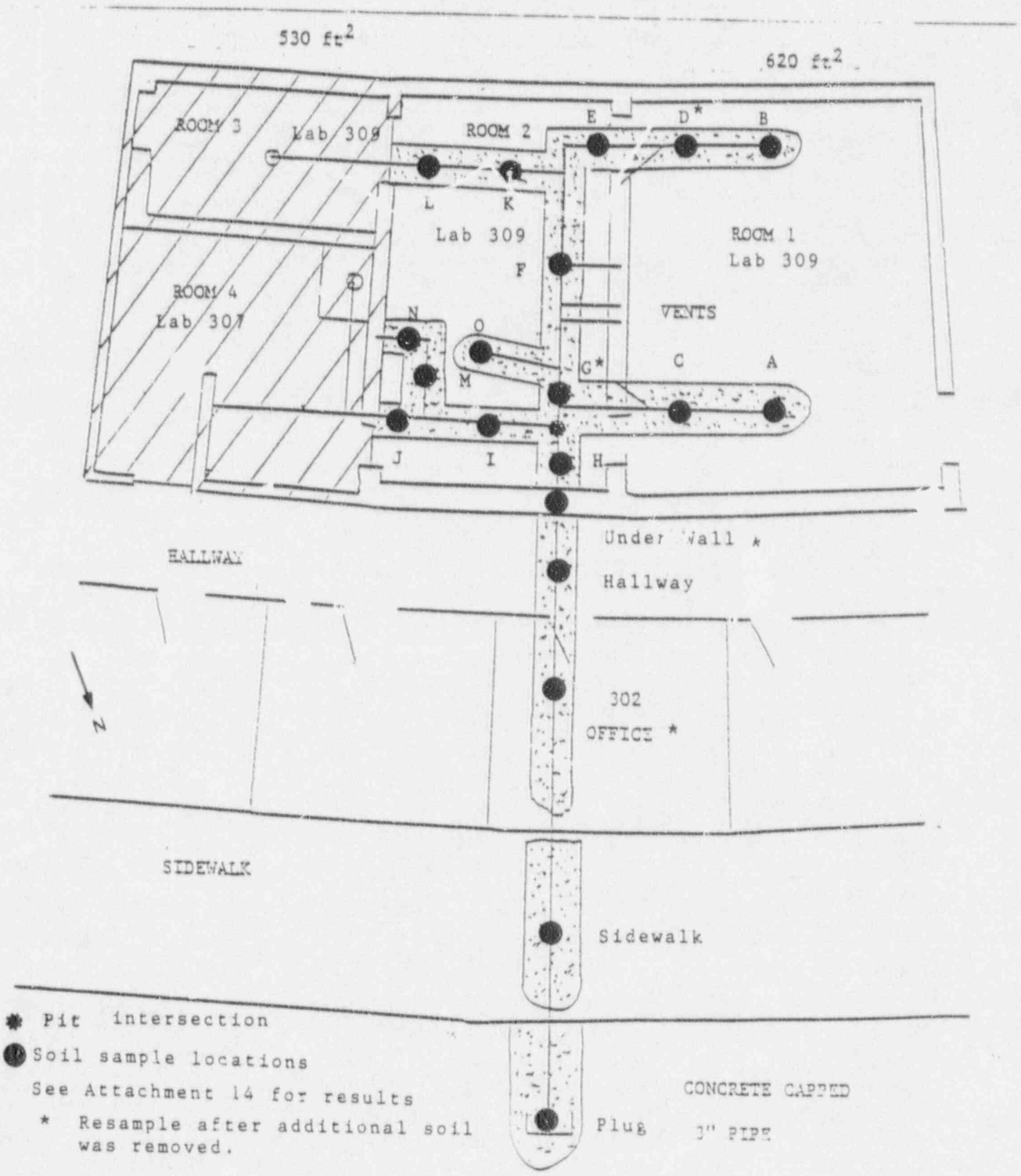
Attachment 10: Initial Soil Sample Locations



● Sample Locations

(See Attachment 11 for results)

Attachment 12: Final Soil Sample Locations



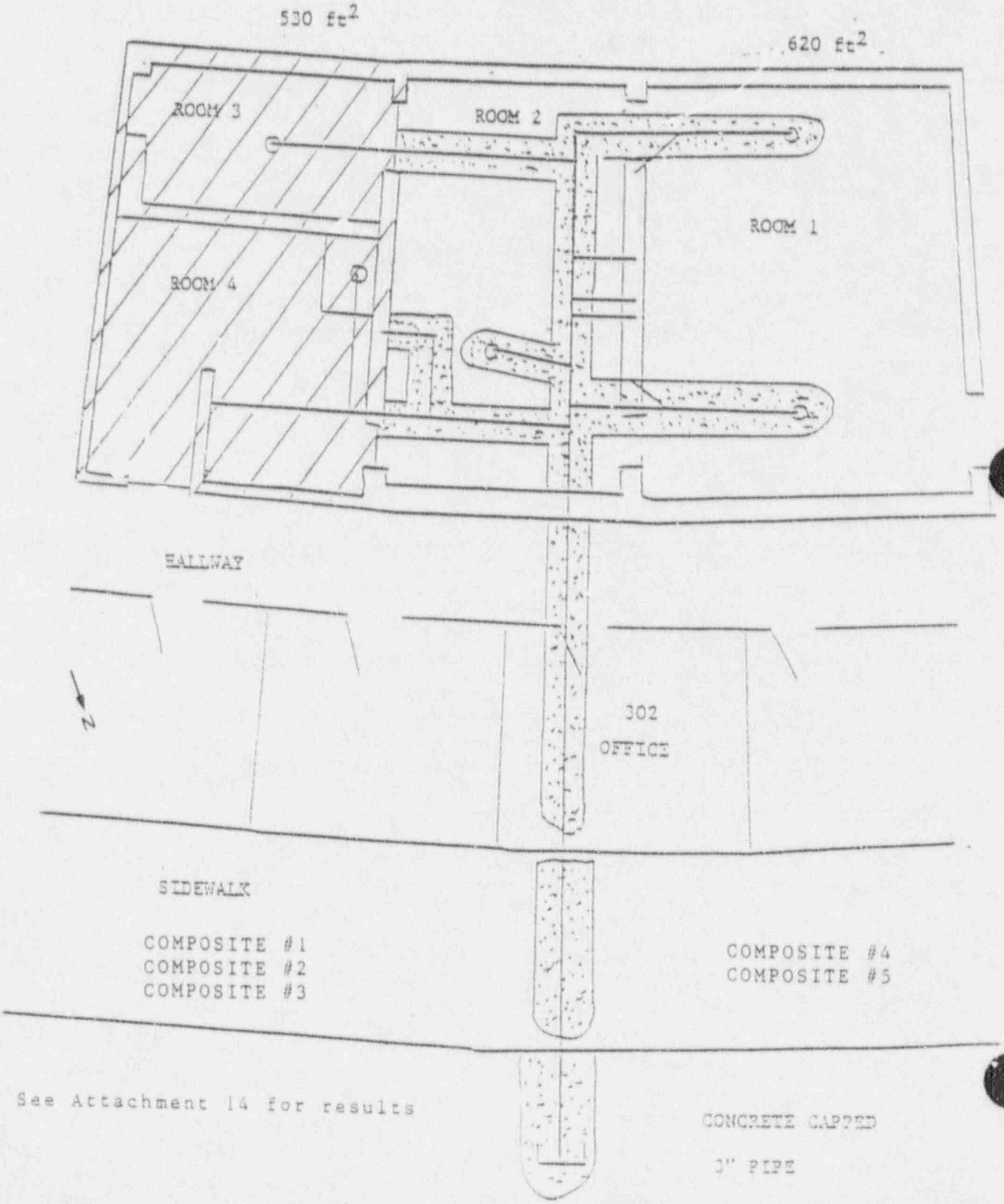
✸ Pit intersection

● Soil sample locations

See Attachment 14 for results

* Resample after additional soil was removed.

Attachment 13: Final <u>Composite</u> Soil Sample Locations



See Attachment 14 for results

ATTACHMENT 14

FINAL SOIL SAMPLE RESULTS

LAB 309

Sample ID #	Co-60	Ba-133	Cs-137	Eu-154	Th-228	Ra-226	Ra-228	U-238	U-235	Sr-90
	Radionuclide Concentration (pCi/g)									
INDIVIDUAL SOIL SAMPLES (SEE ATTACHMENT 12 FOR LOCATIONS)										
Plug	ND	ND	0.14 ± 0.01	0.20 ± 0.01	0.80 ± 0.30	0.60 ± 0.02	0.90 ± 0.05	1.70 ± 0.10	0.05 ± 0.03	
Sidewalk	0.27 ± 0.03	ND	2.70 ± 0.07	ND	0.50 ± 0.07	0.33 ± 0.04	0.50 ± 0.07	0.90 ± 0.20	0.06 ± 0.01	
302 Office (RESAMPLE)	ND	ND	0.00 ± 0.02	ND	0.60 ± 0.07	0.40 ± 0.04	0.60 ± 0.08	ND	ND	
Hallway	2.20 ± 0.10	ND	1.40 ± 0.08	ND	1.40 ± 0.10	0.80 ± 0.90	1.50 ± 0.20	ND	0.10 ± 0.04	
Under Wall (RESAMPLE)	0.70 ± 0.02	ND	0.05 ± 0.02	ND	1.30 ± 0.09	0.16 ± 0.05	1.40 ± 0.10	2.50 ± 0.30	0.20 ± 0.02	<5
A	ND	ND	ND	ND	0.94 ± 0.20	0.60 ± 0.07	ND	ND	ND	
B	ND	ND	3.20 ± 0.10	ND	0.80 ± 0.10	0.50 ± 0.09	1.00 ± 0.20	1.70 ± 0.40	ND	
C	1.30 ± 0.10	0.30 ± 0.07	0.67 ± 0.07	ND	1.30 ± 0.10	0.70 ± 0.10	1.30 ± 0.30	ND	0.10 ± 0.05	
D-RESAMPLE	ND	ND	0.76 ± 0.04	ND	0.80 ± 0.06	0.50 ± 0.04	0.80 ± 0.10	ND	0.09 ± 0.02	
E	0.90 ± 0.04	ND	0.35 ± 0.03	ND	0.80 ± 0.07	0.50 ± 0.05	0.80 ± 0.10	ND	0.09 ± 0.02	
F	0.20 ± 0.04	ND	0.18 ± 0.03	ND	1.00 ± 0.15	0.60 ± 0.07	0.90 ± 0.20	1.70 ± 0.04	0.10 ± 0.30	
G-RESAMPLE	0.80 ± 0.05	ND	0.30 ± 0.05	ND	1.40 ± 0.08	0.90 ± 0.06	1.40 ± 0.10	2.10 ± 0.30	0.18 ± 0.03	
H	0.20 ± 0.03	ND	0.30 ± 0.04	ND	0.60 ± 0.10	0.30 ± 0.05	0.60 ± 0.10	1.00 ± 0.30	0.06 ± 0.03	39
I	1.90 ± 0.10	ND	1.00 ± 0.07	ND	1.40 ± 0.10	0.90 ± 0.10	1.40 ± 0.20	2.20 ± 0.50	0.17 ± 0.04	
J	ND	ND	0.10 ± 0.02	ND	1.30 ± 0.07	0.90 ± 0.06	1.40 ± 0.10	2.60 ± 0.30	0.25 ± 0.03	
K	ND	ND	0.23 ± 0.02	ND	0.60 ± 0.06	0.40 ± 0.04	0.70 ± 0.10	1.10 ± 0.20	0.08 ± 0.02	
L	ND	ND	1.79 ± 0.06	ND	0.70 ± 0.10	0.70 ± 0.10	0.70 ± 0.10	1.40 ± 0.20	0.07 ± 0.02	

ATTACHMENT 14

FINAL SOIL SAMPLE RESULTS

LAP 309

Radionuclide Concentration (pCi/g)

Sample ID #	Co-60	Ba-133	Cs-137	Eu-154	Th-228	Ra-226	Ra-228	U-238	U-235	Sr-90
INDIVIDUAL SOIL SAMPLES (SEE ATTACHMENT 12 FOR LOCATIONS)										
M	ND	ND	0.20 ± 0.04	ND	1.40 ± 0.10	0.90 ± 0.10	1.30 ± 0.20	1.90 ± 0.40	0.11 ± 0.03	
N	ND	ND	ND	ND	1.40 ± 0.10	0.70 ± 0.05	1.30 ± 0.10	2.0 ± 0.30	0.12 ± 0.02	
O	0.50 ± 0.01	ND	0.83 ± 0.02	ND	0.90 ± 0.03	0.60 ± 0.02	0.90 ± 0.05	1.30 ± 0.10	0.09 ± 0.01	
COMPOSITE SOIL SAMPLES (SEE ATTACHMENT 13 FOR LOCATIONS)										
Composite 1	0.50 ± 0.05	0.06 ± 0.2	2.20 ± 0.07	ND	1.30 ± 0.07	0.90 ± 0.07	1.30 ± 0.10	1.80 ± 0.30	0.17 ± 0.03	7
Composite 2 (RESAMPLE)	0.60 ± 0.03	0.10 ± 0.03	3.60 ± 0.04	0.18 ± 0.06	1.40 ± 0.04	0.90 ± 0.08	1.50 ± 0.08	2.20 ± 0.16	0.06 ± 0.04	<6
Composite 3	0.70 ± 0.02	0.05 ± 0.01	1.69 ± 0.03	0.30 ± 0.06	1.10 ± 0.03	0.70 ± 0.05	1.50 ± 0.06	1.80 ± 0.10	0.05 ± 0.04	9
Composite 4	ND	ND	0.63 ± 0.04	ND	1.30 ± 0.10	0.90 ± 0.10	1.30 ± 0.20	1.70 ± 0.30	0.16 ± 0.03	2
Composite 5	ND	ND	0.61 ± 0.04	ND	1.20 ± 0.10	1.00 ± 0.10	1.30 ± 0.10	2.10 ± 0.30	0.13 ± 0.03	1
SPLIT SAMPLES – STATE OF CALIFORNIA (PIT INTERSECTION)										
Small Hole	2.75 ± 0.13	ND	0.43 ± 0.06	0.34 ± 0.36	1.36 ± 0.12	0.73 ± 0.10	1.33 ± 0.22	2.00 ± 0.43	0.17 ± 0.04	
Big Hole	3.93 ± 0.15	ND	ND	ND	1.47 ± 0.13	0.85 ± 0.16	1.46 ± 0.25	2.18 ± 0.50	0.18 ± 0.05	
SPLIT SAMPLES – ORAU – PIT INTERSECTION (ONLY AREA REQUIRING ADDITIONAL CLEANUP DURING ORAU SURVEY										
Initial sample	12.54 ± 0.64	ND	ND	ND	1.06 ± 0.24	0.72 ± 0.30	1.03 ± 0.41	ND	ND	
Initial Sample	15.26 ± 0.29	ND	ND	1.06 ± 0.36	1.51 ± 0.17	0.92 ± 0.15	1.26 ± 0.15	2.20 ± 0.70	ND	

ATTACHMENT 14

FINAL SOIL SAMPLE RESULTS

LAB 309

Radionuclide Concentration (pCi/g)

Sample ID #	Co-60	Ba-133	Cs-137	Eu-154	Th-228	Ra-226	Ra-228	U-238	U-235	Sr-90
Final Samples										
Small Hole	0.16 ± 0.04	ND	ND	ND	1.03 ± 0.10	0.55 ± 0.07	1.18 ± 0.17	1.39 ± 0.33	0.08 ± 0.03	
Big Hole	2.48 ± 0.24	ND	ND	ND	1.33 ± 0.23	0.93 ± 0.19	1.30 ± 0.42	ND	0.18 ± 0.07	
OTHER ORAU SPLIT SAMPLES (SEE REFERENCE 2 FOR COLLECTION OF SAMPLES COLLECTED)										
006A AT1.5, 5.8 RM 309	0.17 ±0.05	0.19 ± 0.07	4.60 ± 0.14	ND	1.13 ± 0.11	0.69 ± 0.08	1.17 ± 0.20	ND	0.13 ± 0.04	
GRTSMS0041RM307	0.58 ±0.06	0.10 ± 0.04	0.50 ± 0.05	ND	1.07 ± 0.44	0.70 ± 0.07	1.16 ± 0.20	1.65 ± 0.34	0.13 ± 0.03	
BOTTOM OF TRENCH										
001A13,1.5	ND	ND	0.10 ± 0.03	ND	0.85 ± 0.08	0.53 ± 0.07	0.85 ± 0.17	1.58 ± 0.32	0.58 ± 0.04	
HALFWAY 002A	0.23 ±0.01	ND	0.03 ± 0.01	ND	0.99 ± 0.03	0.75 ± 0.04	1.04 ± 0.05	1.73 ± 0.12	0.14 ± 0.01	
005A RM307	ND	ND	1.20 ± 0.09	ND	1.43 ± 0.12	1.02 ± 0.11	1.75 ± 0.24	2.53 ± 0.46	0.23 ± 0.05	
GRTSMS008ARM309	ND	ND	0.06 ± 0.02	ND	0.85 ± 0.08	0.67 ± 0.12	0.92 ± 0.16	1.32 ± 0.35	0.11 ± 0.04	
GRTSMS003A	ND	ND	0.68 ± 0.06	ND	1.26 ± 0.11	0.73 ± 0.08	1.12 ± 0.18	2.23 ± 0.04	0.17 ± 0.04	
BOTTOM OF TRENCH OUTSIDE										

Note: ND = Not Detectable Means:

Cs-137 = <0.1 pCi/gram

Co-60 = <0.1 pCi/gram

Ba-133 = <0.1 pCi/gram

U-235 = <0.1 pCi/gram

Ba-133 = <0.1 pCi/gram

Eu-154 = <0.2 pCi/gram

U-238 = <3.0 pCi/gram

MAR 1 6 1989

GROSS ALPHA/BETA COUNTING RESULTS FOR WIPE SAMPLES

		ALPHA		BETA	
SAMPLE ID	COUNT LENGTH MIN	DPM/100 SQ.CM.	% ERROR 95% CL	DPM/100 SQ.CM.	% ERROR 95% CL
L-315 W-1 Lab 315	1.	<9.740E-03	95.00	4.770E 00	52.97
2 3/16/89 Lab 315	1.	<9.740E-03	95.00	<4.660E-01	95.00
3 Lab 315	1.	<9.740E-03	95.00	<2.905E-02	95.00
4 Lab 315	1.	<9.740E-03	95.00	<1.000E 00	95.00
AVERAGE		9.740E-03		1.568E 00	
HIGH		9.740E-03		4.770E 00	
LOW		9.740E-03		2.905E-02	

NOTE: THE ERRORS DO NOT INCLUDE INHERENT EFFICIENCY CALIBRATION UNCERTAINTIES.

Note: See Attachment 7 for wipe sample locations

Attachment 13: Contamination Survey Results

GA's tenants are, of course, not allowed to conduct any activities involving the use of radioactive material under GA's license. Further, no tenant has applied on their behalf for an NRC license. There have been, though, instances consistent with the scenario GA presented to NRC in Ref. c, where GA tenants have applied to the State of California for by-product material licenses.

GA controls activities involving the use of radioactive material by its employees through the Work Authorization process as described in Section 3 of the specifications volume of GA's SNM license. Work Authorization requests are reviewed by, and must be approved by (among others), the Manager of Health Physics and the Manager of Licensing, Safety and Nuclear Compliance. These managers, as well as others, have been actively involved in the formulation of GA's policy to not use licensed material in areas that have been subjected to confirmatory surveys. Thus, they have not, nor would they, approve a request for a Work Authorization to use licensed material in surveyed areas. Incidentally, there have been no Work Authorization requests to conduct activities involving licensed material in any of the surveyed areas.

Enclosed is a check in the amount of $150 for the application fee covering this license amendment request.

We trust you will find this letter responsive to your letter of October 19, 1989. If you should have any questions or need any additional information, please contact me at (619) 455-2823.

Very truly yours,

Keith E. Asmussen

Keith E. Asmussen, Manager
Licensing, Safety and
Nuclear Compliance

Attachment (as stated)
cc: John B. Martin, Regional Administrator,
U.S. NRC, Region V
Merri Horn, NRC Headquarters

General Atomics' Areas Meeting NRC and State of California Criteria for Release to Unrestricted Use as Confirmed by Oak Ridge Associated Universities' Environmental Survey and Site Assessment Team

I <u>Building 2 - Science Laboratories Building</u>

<u>Group 1</u> (total area: about 10,115 ft^2)

Related confirmatory documentation:
GA Survey Report: Ref. 1 and Ref. 2 (Ref. 2 supesedes Ref. 1)
NRC Inspection/Survey Report: Ref. 3

Labs/Rooms: 102, 104, 107, 109, 111, 113, 115, 117, 119, 122, 128, 130, 132, 134, 137, 139, 141, 143, 145, 147, 149, 151, 154, 641 and 643

Mezzanines associated with labs: 115, 117, 119, 122, 641 and 643

Mezzanines only: none

<u>Group 2</u> (total area: about 5,652 ft^2)

Related confirmatory documentation:
GA Survey Report: Ref. 4
ORNL Survey Report: Ref. 5
NRC letter: Ref. 6

Labs/Rooms: 228, 230, 232, 236, 311, 313, 319, 331, 333, 419, 421, 435 and 437

Mezzanines associated with labs: 331, 333, 419 (extends over 417), 435 and 437

Mezzanines only: 417

<u>Group 3</u> (total area: about 9,612 ft^2)

Related confirmatory documentation:
GA Survey Report: Refs. 7 and 8
ORNL Survey Report: Ref. 9
NRC letter: Ref. 10

70-734
PDR

GENERAL ATOMICS

DOCKETED
USNRC
NOV 27 1989
MAIL SECTION
DOCKET CLERK

DOCKETED
USNRC
NOV 27 1989

November 17, 1989
696-1472

Mr. Leland C. Rouse, Chief
Fuel Cycle Safety Branch
Division of Industrial and Medical Nuclear Safety
Office of Nuclear Material Safety & Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Docket 70-734: SNM-696; Request to Delete Certain Portions of Facilities From General Atomics' License

References:

a) Asmussen, Keith E., letter 696-8023 to William T. Crow, "Plan for Obtaining Release of Certain Areas to Unrestricted Use," dated October 1, 1985

b) Asmussen, Keith E., letter 696-9096 to William T. Crow, "Plan for Obtaining Release of Approximately 215 Acres to Unrestricted Use," dated December 15, 1986

c) Asmussen, Keith E., letter 696-1146 to Robert D. Thomas, "*Request for Release to Unrestricted Use,*" dated November 18, 1987

d) Rouse, Leland C., letter to Keith Asmussen dated October 19, 1989

Dear Mr. Rouse:

As you are aware, General Atomics (GA) has been decontaminating portions of its land and facilities to meet NRC-approved criteria for release to unrestricted use. These efforts are being conducted in accordance with two NRC-approved plans (Refs. a and b) and SNM-696 license condition 25. To date, approximately 295 acres of land have been released, as reflected in amendments 9 and 12 to GA's license.

In addition, GA has been in the process of identifying portions of its facilities for which it has no plans to conduct future activities involving the use of radioactive materials. These areas are being decontaminated to meet NRC-approved criteria for release to unrestricted use and,

10955 JOHN JAY HOPKINS DRIVE, SAN DIEGO, CA 92121-1194 PO BOX 85608, SAN DIEGO, CA 92138-5608 (619) 455-3000

26114

upon receiving confirmation from NRC that the areas meet the criteria for release to unrestricted use, some of these areas, or portions thereof, are being leased to outside companies. Prior to embarking on this effort in 1987, GA sought and obtained NRC guidance and concurrence regarding proceeding in this manner. GA was informed that the NRC preferred not to delete portions of a licensee's building from its license in piecemeal fashion.

Proceeding with the approach described above, GA made its first request in November 1987 (Ref. c). At that time, GA requested the release of selected laboratories and their associated offices to unrestricted use, but, consistent with the above described approach, did not request a license amendment. However, in accordance with your letter of October 19, 1989 (Ref. d), GA will in the future include an appropriate request for a license amendment with each request for a confirmatory survey.

As was agreed to during conversations between Mr. McCaughey and Ms. Horn of your staff and myself, GA hereby requests NRC to delete from GA's license all portions of Buildings 2 and 9 which GA has previously requested to be released to unrestricted use. In Building 2, this consists of selected laboratories and associated offices; in Building 9, the areas consist of selected rooms, hallways and portions thereof. The specific laboratories, rooms and areas are listed in the attachment to this letter.

In Building 2, GA has referred to a collection of laboratories (and associated offices) which were surveyed during a particular confirmatory survey as a "group" of laboratories. In Building 9, GA has referred to the collection of areas surveyed during a particular confirmatory survey effort as a "stage." This notation has been used in GA's correspondence requesting confirmatory surveys and is used in the attachment to this letter.

The attachment to this letter also references documents related to each GA request for a confirmatory survey/ release to unrestricted use. This list includes references for associated documentation such as: GA's transmittal letters for reports documenting GA's final survey results, NRC inspection reports/letters, Oak Ridge Associated Universities final reports, etc.

The following discussion addresses how it is assured that the use of NRC-licensed material has not been and will not be allowed in areas for which confirmatory surveys have been conducted.

Labs/Rooms: 234, 302, 309 room 1, 309 room 2, 315, 321, 323, 327, 343, 345, 347, 425, 427, 429, 431, 433, 647, 649 and 651

Mezzanines associated with labs: 321, 323, 327, 343, 345, 347, 425, 427, 429, 431, 433 and 647

Mezzanines only: 325, 335, 337, 339, 341, 349, 615, 617 and 645

Group 4 (total area: about 3,749 ft^2)

Related confirmatory documentation:
GA Survey Report: Ref. 11
ORNL Survey Report: expected in December 1989

Labs/Rooms: 317, 355, 357, 359, 361, 554, 556, 558, 560, 562 and 564

Mezzanines associated with labs: 317, 359 and 361

Mezzanines only: none

II. Building 9 - Experimental Building

Building 9 exclusive of "Hot Suite" Area

Related confirmatory documentation:
GA Survey Report: Ref. 12
NRC Inspection/Survey Report: Ref. 13

Areas: See attached Figure 1.

Stage 1 of "Hot Suite" Area (total area: about 2,880 ft^2)

Related confirmatory documentation:
GA Survey Report: Ref. 14
ORNL Survey Report: REf. 9
NRC Concurrence: Ref. 10

Rooms/Areas: 39, 48, 49A, 50, 46B[1], 47A, hallways east and south of room 47A, 38, 34[2], 33[3], and hallway east of room 38--see attached Figures 1 and 2

Stage 2 of "Hot Suite" Area (total area: about 587 ft^2)

Related confirmatory documentation:
GA Survey Report: Ref. 15
ORNL Survey Report: expected in December 1989

Rooms/Areas: 40, 41, 42, 43 and 47--see attached Figures 1 and 2

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[1] Room denoted here and in ORAU's report as 46B was included in what was referred to as hallway in GA's reports.

[2] Room denoted here and in ORAU's report as 34 was denoted as 35 in GA's reports.

[3] Room denoted here and in ORAU's report as 33 was denoted as 34 in GA's reports.

References

1. Asmussen, K. E., letter no. 696-1146 to Robert D. Thomas, *"Request for Release to Unrestricted Use,"* dated November 18, 1987. [Group 1]

2. Asmussen, K. E., letter no. 696-1163 to Robert D. Thomas, *"Request for Release to Unrestricted Use - Revised Final Report,"* dated January 19, 1988.

3. Montgomery, James L., letter to R. N. Rademacher, *"Inspection at GA Technologies Inc. (Confirmatory Survey),"* dated February 26, 1988. Letter transmitted Inspection Report No. 70-734/87-15.

4. Asmussen, K. E., letter no. 696-1231 to Robert D. Thomas, *"Request for Release of Selected Laboratories to Unrestricted Use,"* dated May 10, 1988.

5. Cotten, P. R., *"Confirmatory Survey of Phase IV Decommissioning / General Atomics / San Diego, California,"* ORAU Final Report ORAU 88/J-89, dated November 1988.

6. McCaughey, David A., letter to Keith E. Asmussen, dated December 15, 1988.

7. Asmussen, K. E., letter no. 696-1318 to Mr. Robert D. Thomas, *"Request for Release of Selected Laboratories to Unrestricted Use (Group 3),"* dated December 21, 1988.

8. Asmussen, K. E., letter no. 696-1464 to R. F. Fish, *"Addendum to 'Group 3' Report Dated December 21, 1988,"* [Note: "Group 3" Report was dated December 21, 1988; the addendum was dated September 2, 1989.] dated October 17, 1989.

9. Cotten, P. R., *"Confirmatory Survey of Facilities in Buildings 2 and 9 / General Atomics / San Diego, California,"* ORAU Final Report ORAU 89/F-98, July 1989.

10. Yuhas, Gregory P., letter to R. N. Rademacher, *"NRC Inspection,"* (with ORAU Final Report ORAU 89/F-98 dated July 1, 1989), dated August 18, 1989.

11. Asmussen, K. E., letter no. 596-1447 to Mr. R. F. Fish, *"Request for Confirmatory Survey (Selected Laboratories in Building 2 - Group 4),"* dated September 13, 1989.

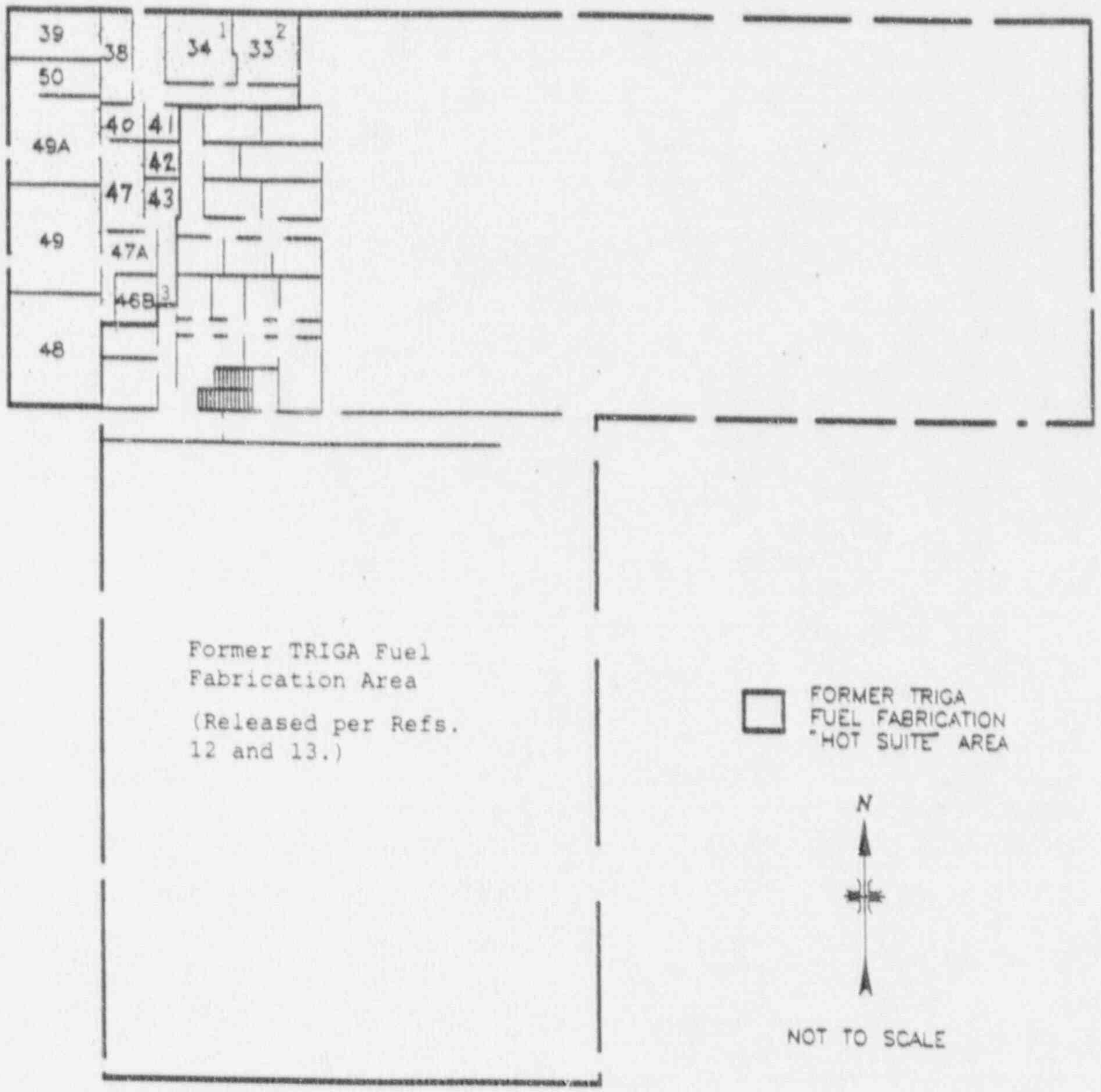
12. Asmussen, K.E., letter no. CAL-1095 to Ben Kapel (State of California [with copy to James Montgomery, NRC Region V], *"Final Survey Report of the Decontamination of GA Technologies' Experimental Building,"* dated July 28, 1987.

13. Montgomery, James L., letter to R. N. Rademacher, *"Inspection at GA-Technologies, Inc. (Confirmatory Survey),"* dated October 1, 1987.

14. Asmussen, Keith E., letter no. 696-1337 to Robert D. Thomas, *"Request for Confirmatory Survey (Experimental Building - Stage 1),"* dated January 30, 1989.

15. Asmussen, K. E., letter no. 696-1443 to Mr. R. F. Fish, *"Request for Confirmatory Survey (Experimental Building - Stage 2),"* dated August 31, 1989.

Attachment to 696-1472

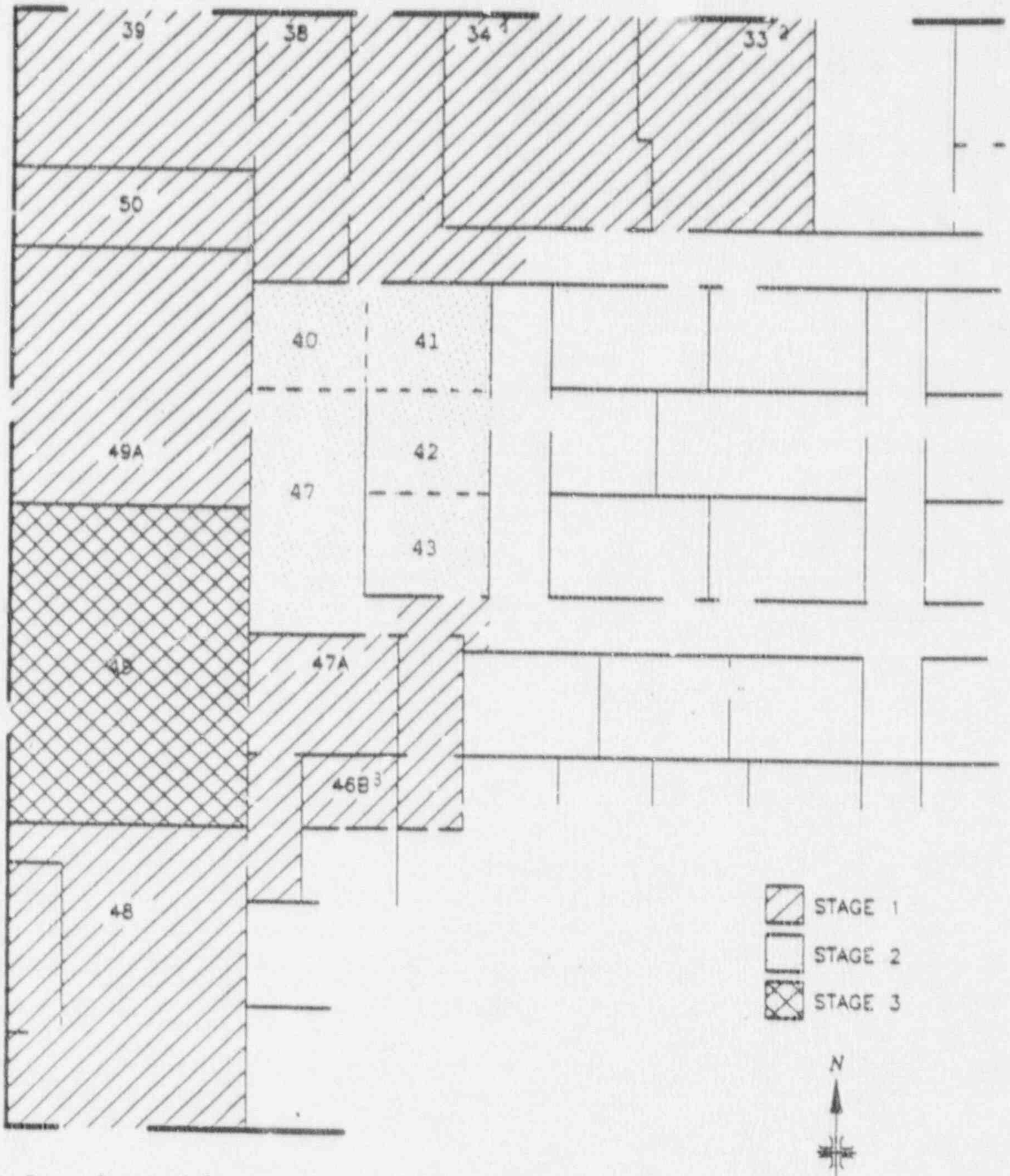


(1) Room denoted here and in ORAU's report as 34 was denoted as 35 in GA's reports.

(2) Room denoted here and in ORAU's report as 33 was denoted as 34 in GA's reports.

(3) Room denoted here and in ORAU's report as 46B was included in what was referred to as hallway in GA's reports.

Figure 1. General Atomics' Experimental Building (Bldg. 9) Showing Former TRIGA Fuel Fabrication Area and Former TRIGA Fuel Fabrication "Hot Suite" Area



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(3) Room denoted here and in ORAU's report as 46B was included in what was referred to as hallway in GA's reports.

NOT TO SCALE

Figure 2. Decontamination "Stages" for the "Hot Suite" Area of General Atomics' Experimental Building (Bldg. 9)

ORAU REPORTS

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CONFIRMATORY SURVEY
OF
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

P. R. COTTEN

Radiological Site Assessment Program
Manpower Education, Research, and Training Division

FINAL REPORT
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Final Report

November 1988

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INTRODUCTION AND SITE HISTORY

In mid 1984, General Atomics (GA) of San Diego, California, initiated decommissioning activities for the purpose of releasing portions of their facilities from Nuclear Regulatory Commission (NRC) licensing restrictions. The decommissioning is being accomplished in separate phases. Phase I activities included the Solar Evaporation Pond area, the areas immediately surrounding the former Waste Processing Facility, the Incinerator Pad, a previous burial site for contaminated asphalt, the hillside and canyon below the waste handling facilities, and undeveloped land surrounding the waste processing facilities; Phase II areas were the former Waste Processing Facility and the Incinerator Pad; and Phase III consisted of approximately 87 hectares of undeveloped land, surrounding the main General Atomics plant facilities, and the shipping and receiving area of Building 5. These Phase I, II, and III areas were previously remediated and confirmatory surveys performed by ORAU. Results of those surveys are presented in separate reports.[1-3]

Two small land areas, B1 and B3, were excluded from the Phase III decommissioning activities. Area B1 consists of three canyons behind the Hot Cell and TRIGA facilities. Area B3 is the former sewage treatment facility known as "Callan Ponds". These two areas and twelve laboratories in Building 2 of the L Building Complex have been designated as Phase IV decommissioning. Potential radiological contaminants on these portions of the General Atomics site, have been identified as enriched uranium, thorium, and longer half-life fission and activation products.

At the request of the Nuclear Regulatory Commission, Region V Office, the Radiological Site Assessment Program of Oak Ridge Associated Universities conducted a radiological survey to confirm the status of the Phase IV area, relative to the NRC guidelines for release to unrestricted use. This survey was performed June 20-29, 1988, in accordance with a survey plan submitted to the Region V Office of the NRC (Appendix A). Procedures and results of this survey are presented in this report.

SITE DESCRIPTION

The General Atomics facilities are located near the intersection of Interstate 5 and Genesee Road, approximately 20 km north of San Diego, CA (Figures 1 and 2). Phase IV areas are illustrated in Figure 3. The 6.1 hectares of Area B1, shown in Figure 4, is undeveloped; the terrain consists primarily of extremely heavy brush, steep hills, and canyons with limited accessibility.

Area B3, also known as "Callan Ponds", is a former sewage treatment facility occupying approximately 1.2 hectares (Figure 5). Various structures in this area include the flocculating tanks, a trickle filter tank, two clarifying tanks, a primary (north) and secondary (south) digester, and the basement and concrete foundation of the pumphouse. The majority of the buildings are circular tanks of various depths and heights. The flocculating tanks and pumphouse basement are rectangular structures. East of the digesters are three shallow evaporation ponds.

The L Building Complex, containing Building 2, is the focal point of the plant site. Building 2 is divided into three laboratory sections (A, B, and C), and is used to house office and laboratory facilities. Many of the labs are no longer operational, and GA has identified non-radioactive material programs for this space. Twelve specific labs in section B and C have been identified for verification (Figures 6 thru 8).

PROCEDURES

Objectives

The objectives of the survey were to confirm that the radiological condition of the Phase IV areas is accurately presented in the General Atomics report and to provide information and data for evaluation of the site status, relative to NRC guidelines for release for unrestricted use.

Document Review

The licensee's survey report for the release of the Phase IV area for unrestricted use and other supporting documents were reviewed by ORAU[4-6]. Data presented in these reports were compared to the established release guidelines.

Survey Plan

A plan was prepared, based on the review of GA documents and standard ORAU procedures for confirmatory radiological survey. The plan was submitted to the NRC, Region V, for review and comment. A copy of the survey plan has been included as Appendix A of this report.

Building 2 Survey

Gridding

An alphanumeric 2 m x 2 m reference grid system was established on the floor and lower walls (up to 2 m) of laboratories in Building 2. These include Rooms 228, 230, 232, and 236 of Section B and 311, 319, 331/333, 419/421, and 435/437 of Section C (Figures 7 and 8). Lab combinations of 331/333, 419/421, and 435/437 were gridded together as one room. Figures 9 through 20 show the room layouts and reference grid systems. Measurements on the upper walls and ceiling were referenced to the floor grid system. The mezzanine areas of rooms 419/421, 331/333, and 435/437 were not gridded. Measurement locations were referenced to prominent building features.

Surface Scans

Alpha, beta-gamma, and gamma scans were performed on floors and lower walls, using alpha/beta gas-proportional large area detectors and NaI(Tl) gamma scintillation detectors with audible indicating scaler/ratemeters. Scans of surface areas not accessible to the large area detector, i.e., upper walls, ceilings, and overhead areas such as ledges, beams, piping, fixtures, counter tops, equipment, and ductwork were performed using portable ZnS alpha scintillation and "Pancake" GM beta-gamma detectors. Locations of elevated radiation levels were noted for additional measurements.

Measurement of Surface Contamination Levels

A total of 60 grid blocks on the floor and lower walls in the gridded areas of Building 2 were randomly selected for surface contamination measurements. Figures 9 through 17 indicate the grid blocks selected for five point measurements. In each grid surveyed, direct measurements of alpha and beta-gamma contamination levels were systematically performed at the center and four points midway between the center and block corners. Smears for removable alpha and beta contamination were performed at that location in each grid block where the highest direct level was obtained.

Seventy-four single point measurements for total and removable alpha and beta-gamma contamination levels were performed on upper walls, overhead surfaces (higher than 2 m) such as ledges, ceilings, beams, pipes, ductwork, and miscellaneous equipment. Measurement locations are indicated on Figures 9 through 20.

Exposure Rate Measurements

Gamma exposure rates were measured at 10 locations in Sections B and C of Building 2. A pressurized ionization chamber (PIC) was used for these measurements.

Outdoor Survey

Gridding

Because of inaccessibility, a reference grid system was not established in Area B1. Radiation levels and sampling locations were referenced to prominent land features; the survey was concentrated in the canyons and drainage areas.

In Area B3, a 10 m reference grid system was established over the region of the evaporation ponds (Figure 21). Prominent surface features and landmarks were used to reference the location of measurements in the vicinity of the process buildings and the surrounding area.

Surface Scans

Walkover gamma surface scans were conducted at 1 to 2 m intervals in accessible locations of areas B1 and B3. Portable NaI(Tl) gamma scintillation detectors with audible indicating ratemeters, were used to perform these scans.

Exposure Rate Measurements

Exposure rate measurements were made at the surface and at 1 m above the surface at gridline intersections and at locations, randomly selected for sample collection (Figures 21 through 23). Portable gamma scintillation detectors, calibrated onsite against a pressurized ionization chamber, were used for these measurements.

Sampling

Surface (0-15 cm) soil samples of approximately 1 kg each were collected at 10 m grid intervals, at property boundaries, and in the ungridded portions of Area B1 and Area B3. Ten soil samples were collected from Area B1 and 79 samples from Area B3 (Figures 21 through 23).

Three boreholes were drilled in evaporation pond 1 and one borehole each in evaporation ponds 2 and 3. Locations of these boreholes are shown on Figure 24. Gamma radiation scans were performed in boreholes to identify elevated radiation levels, which might indicate subsurface residues. A radiation profile was determined by measuring gamma radiation levels at 15 cm intervals between the surface and bottom of the hole. Soil samples were collected at 15 cm intervals. The sampling depth of each hole was approximately 1 m or to "refusal".

Area B3 Facility Survey

Measurement Location References

A reference grid system was not established inside the seven (7) process facility structures in Area B3. Measurement locations were referenced to prominent structure features.

Surface Scans

Alpha, beta-gamma, and gamma scans were performed on the floor and lower walls, using an alpha/beta gas proportional large area detector and NaI(Tl) gamma scintillation detectors. Limited scans of surfaces, not accessible by the large area detector, were performed using portable ZnS alpha scintillation and "Pancake" GM beta-gamma detectors.

Measurement of Surface Contamination Levels

Forty-one single point measurements for total alpha and beta-gamma contamination were performed on the floor and lower walls in the process facility structures. Smears for removable alpha and beta contamination were performed at each location.

Background and Baseline Measurements

Background measurements and soil samples were collected to determine area background and to provide baseline radionuclide concentrations for comparison purposes. Locations of the background measurements and baseline samples are shown in Figure 25.

Sample Analyses and Interpretation of Results

Samples were returned to laboratories in Oak Ridge, Tennessee, for analyses. All samples were analyzed by gamma spectrometry. The major radionuclides of interest were Cs-137, Co-60, U-235, U-238, and Th-232; however, spectra were reviewed for the presence of other significant photopeaks. Selected individual samples and composite samples were also analyzed for Sr-90 and isotopic uranium. Additional information concerning analytical equipment and procedures is presented in Appendices B and C. Survey results were compared to NRC guidelines for decommissioning of the General Atomics Waste Processing Facility (Appendices D and E).

RESULTS

Document Review

ORAU's review of the survey report submitted by GA to the NRC, indicates that the procedures and instrumentation used were consistent with industry accepted practices. GA findings identified elevated areas within the property boundaries in the Hot Cell Area. Samples collected by GA from the drainage areas below the Hot Cell facility contained radionuclide levels within established guidelines.[6]

GA decontaminated 12 laboratories and 3 mezzanine rooms in Building 2. Data presented by GA indicate that these areas are within the established NRC guidelines.

Background Levels and Baseline Concentrations

Background exposure rates and baseline radionuclide concentrations in soil from the vicinity of the General Atomics site are presented in Table 1 and Table 2. Exposure rates ranged from 7 to 13 μR/h, at one meter from the surface. Cobalt 60 concentrations were less than 0.1 pCi/g, Cs-137 ranged from <0.1 to 0.2 pCi/g, U-235 ranged from <0.2 to 0.7 pCi/g, U-238 ranged from 1.1 to 1.6 pCi/g, and total thorium concentrations ranged from 1.3 to 3.2 pCi/g. These levels are typical of radionuclide concentrations normally occurring in the environment.

Building 2 Survey

Surface Scans

Surface scans identified small isolated areas of elevated alpha and beta radiation levels in three laboratory areas. These areas were identified for GA personnel, and additional remedial action was performed. In Lab 331/333 a contaminated laboratory hood and plenum was removed from the room to reduce contamination levels. Resurveys of these areas indicated that the cleanup was effective in reducing the contamination levels below the NRC guideline levels.

Surface Contamination Measurement

Table 3 summarizes the results of surface contamination measurements in Building 2. For the most part, alpha and beta-gamma levels were well below the release criteria and, in many instances, less than the detection sensitivities of the instrumentation. The highest grid block average for alpha was 970 dpm/100 cm^2 and 16000 dpm/100 cm^2 for beta-gamma. The maximum removable alpha and beta contamination levels ranged from <3 to 14 dpm/100 cm^2 and <6 to 12 dpm/100 cm^2, respectively. Following additional removal of contamination the levels for alpha and beta-gamma measurements were reduced to <21 dpm/100 cm^2 and 740 dpm/100 cm^2, respectively. Removable contamination levels were <3 dpm/100 cm^2 for alpha and <6 dpm/100 cm^2 for beta (Table 4).

For single point measurements the highest alpha measurement of 970 dpm/100 cm^2 was measured on a counter top on the mezzanine of Room 331/333, and the highest beta-gamma measurement exceeded 110000 dpm/100 cm^2, identified as a small area on the surface of a laboratory hood in Room 311. After the removal of the paint from this area, contamination levels were reduced to 90 dpm/100 cm^2 for alpha and 1200 dpm/100 cm^2 for beta-gamma (Table 4). The levels of removable contamination for alpha and beta contamination ranged from <3 to 16 dpm/100 cm^2 and <6 to 41 dpm/100 cm^2.

Exposure Rate Measurement

Exposure rate measurements, performed in laboratories designated for confirmation, hallways, and non-occupied office space in Building 2, ranged from 11 to 15 μR/h.

Outdoor Area Survey

Surface Scans

Gamma scans of Area B1 identified some locations of slightly elevated (several times background) gamma radiation levels, near the operating facilities; no elevated gamma levels were noted in Area B3.

Exposure Rate Measurements

Tables 5, 6, and 7 present the results of exposure rate measurements in Area B1 and B3. Exposure rate levels in Area B1 ranged from 15 to 25 μR/h at 1 m above the surface and from 15 to 25 μR/h at surface contact. The highest level was observed at a location near the Hot Cell facility. The elevated readings observed in area B1 are attributed to the operating TRIGA and Hot Cell facilities. Levels in Area B3 ranged from 11 to 17 μR/h at 1 m above the surface and from 11 to 20 μR/h at surface contact.

Radionuclide Concentrations in Soil Samples

Table 8 presents the concentrations of gamma emitting radionuclides, measured in surface soil collected from Area B1. Cobalt-60, concentrations were <0.1 pCi/g, Cs-137, concentrations ranged from <0.1 to 2.2 pCi/g; U-235, ranged from <0.2 to <0.3 pCi/g; U-238, ranged from <0.9 to 1.7 pCi/g; Th-228, 0.1 to 0.6 pCi/g; and Th-232, <0.4 to 1.9 pCi/g. These concentrations are within the ranges of baseline samples.

Table 9 presents the radionuclide concentration in soil samples collected from the surface of Area B3. Concentration ranges were: Co-60, <0.1 to 0.2 pCi/g; Cs-137, <0.1 to 2.0 pCi/g; U-235, <0.2 to 0.7 pCi/g; U-238, <0.5 to

13.0 pCi/g; Th-228, 0.2 to 0.8 pCi/g, and Th-232, <0.3 to 2.7 pCi/g. Approximately 5% of the samples contained U-235 and U-238 concentrations above the range in baseline samples.

Concentrations in subsurface soil samples were within the ranges of baseline samples. The results are tabulated in Table 10. Concentrations of Co-60 ranged from <0.1 pCi/g; Cs-137, <0.1 to 0.2 pCi/g; Ra-226, <0.2 to 1.5 pCi/g; U-235, <0.3 to 0.2 pCi/g; U-238, <0.1 to 4.1 pCi/g; Th-228, 0.3 to 0.7 pCi/g; and Th-232, <0.3 to 2.1 pCi/g. On the basis of these results, there does not appear to be migration of radionuclides into subsurface soils.

Soil samples were randomly selected from Area B1 and Area B3 to determine the concentrations of Sr-90 and isotopic uranium; Table 11 presents the results of these analyses. Strontium-90 concentrations were below the detection sensitivity of the procedure. Isotopic uranium analyses indicate U-235 contributions ranging from natural to slightly enriched. The activity ratio of U-234 to U-235, based on the higher concentration samples presented in Table 11, is approximately 27:1.

Area B3 Facility Surveys

Surface Scans

Surface scans of the process buildings did not identify any locations of elevated alpha, beta-gamma, or gamma radiation levels.

Measurement of Surface Contamination Levels

Table 12 summarizes the results of surface contamination measurements in the process facility buildings in Area B3. The maximum alpha and beta-gamma total contamination levels ranged from <21 to 210 dpm/100 cm^2 and <410 to 2730 dpm/100 cm^2, respectively. Removable contamination ranged from <3 to 5 dpm/100 cm^2 and <6 to 7 dpm/100 cm^2 for alpha and beta, respectively.

COMPARISON OF SURVEY RESULTS WITH GUIDELINES

The guidelines for decommissioning the General Atomics facilities are presented in Appendices D and E. Surface contamination limits for building surfaces are based on primary contaminants of uranium, Cs-137, and Co-60, identified on this site, and are:

Alpha

5000 dpm/100 cm^2, averaged over 1 m^2
15000 dpm/100 cm^2, maximum in 100 cm^2
1000 dpm/100 cm^2, removable

Beta-Gamma

5000 dpm/100 cm^2, averaged over 1 m^2
15000 dpm/100 cm^2, maximum in 100 cm^2
1000 dpm/100 cm^2, removable

Initial surveys of the 12 laboratories indicated that the surface contamination levels were below guideline levels, with the exception of one small area in Room 236, the laboratory hood in Room 311, and several locations in Room 331/333. Additional remedial action by GA personnel reduced the radioactivity levels in these locations to below guideline levels.

Exposure rate guidelines at 1 m above the surface are limited to 10 μR/h, above background, over an area of 30 ft (9.1 m) x 30 ft (9.1 m) or greater; the guideline level for smaller areas is 20 μR/h above background. At General Atomics, the total exposure rate guidelines are thus 19.7 μR/h and 29.7 μR/h, based on an average background level of 9.7 μR/h. With exception of small areas near the Hot Cell and TRIGA facilities in Area B1, the measured exposure levels were below 19.7 μR/h. The measured levels above 19.7 μR/h were limited to small areas and were less than the 29.7 μR/h applicable guideline.

Concentrations of radionuclides in soil were all below the guideline levels established for this decommissioning project.

SUMMARY

At the request of the NRC Region V Office, Oak Ridge Associated Universities performed a confirmatory survey of Phase IV decommissioning activities at General Atomics in San Diego, California, during June 7-28, 1988. The survey included alpha, beta-gamma, and gamma scans; exposure rate measurements; measurements of total and removable surface contamination; and measurements of radionuclide concentrations in soil. The survey identified several small areas of residual contamination in laboratory rooms which were remediated and resurveyed by ORAU. Other measurements and samples were within the established guidelines. Based on these results, it is ORAU's opinion that the decontamination efforts by the licensee have been effective in meeting the radiological conditions, established for release of this site for unrestricted use.

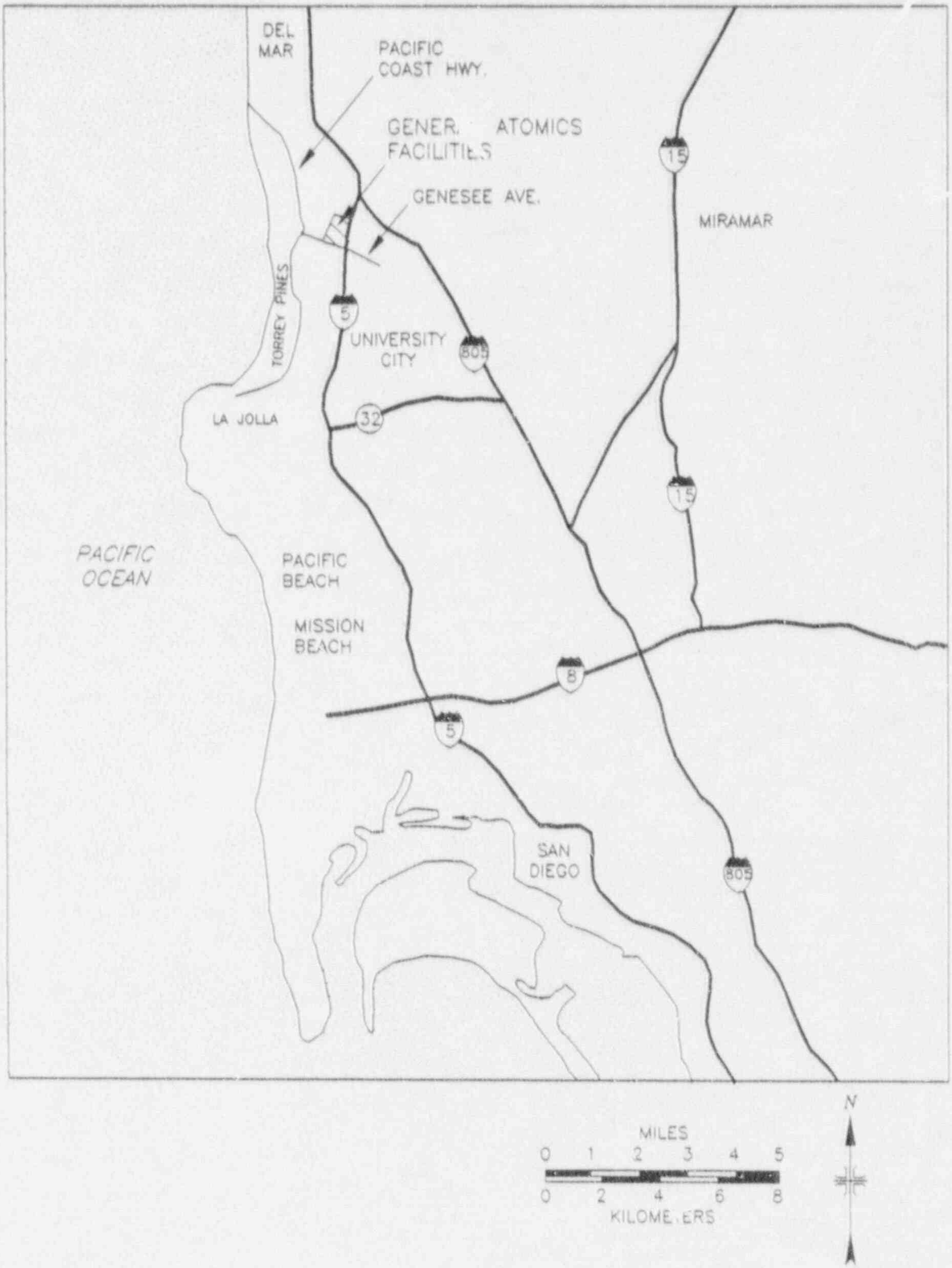

FIGURE 1: Map of the San Diego Area, Indicating the Location of General Atomics Facilities

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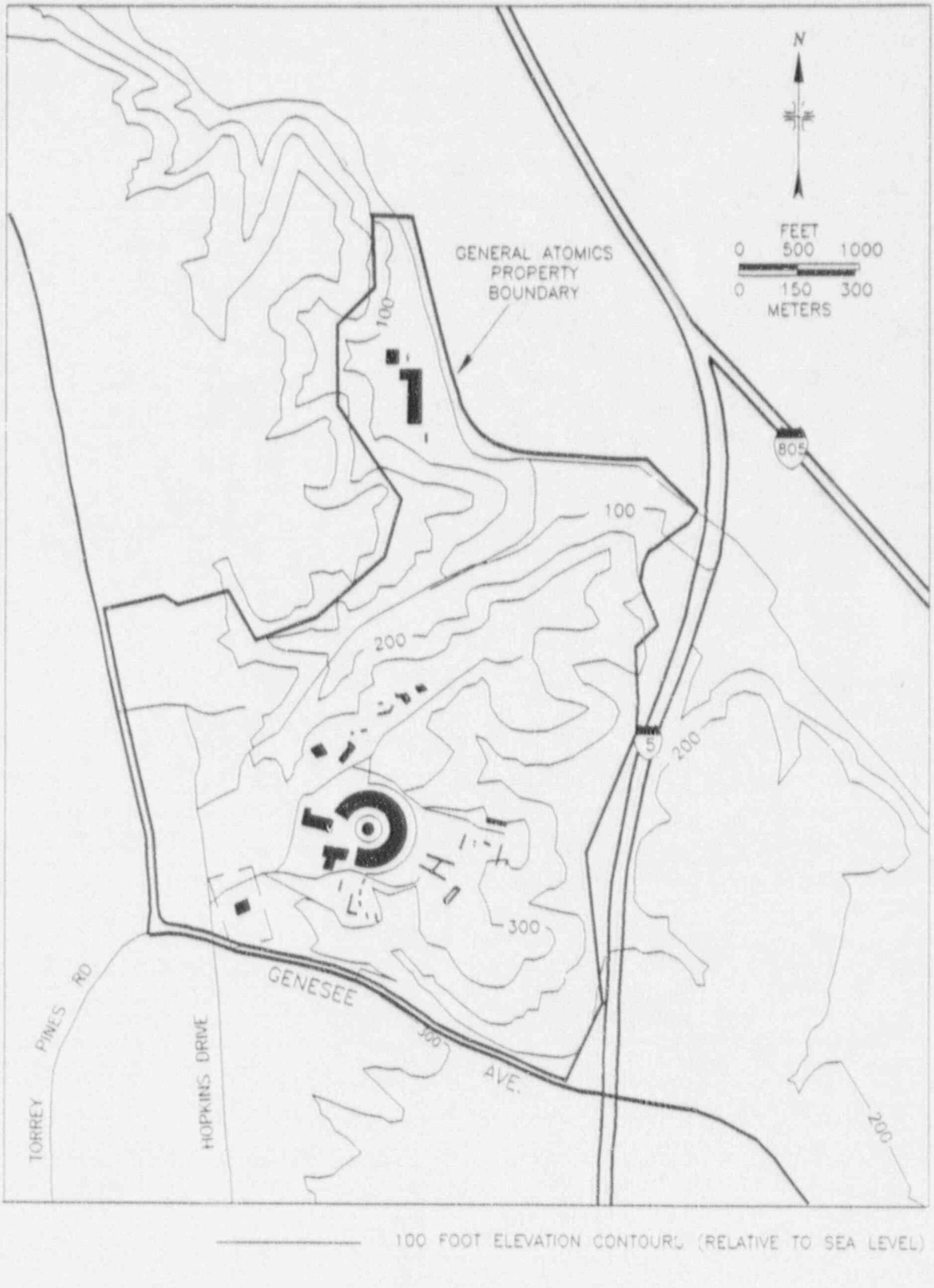

FIGURE 2: General Atomics Plant Layout

GAT10a

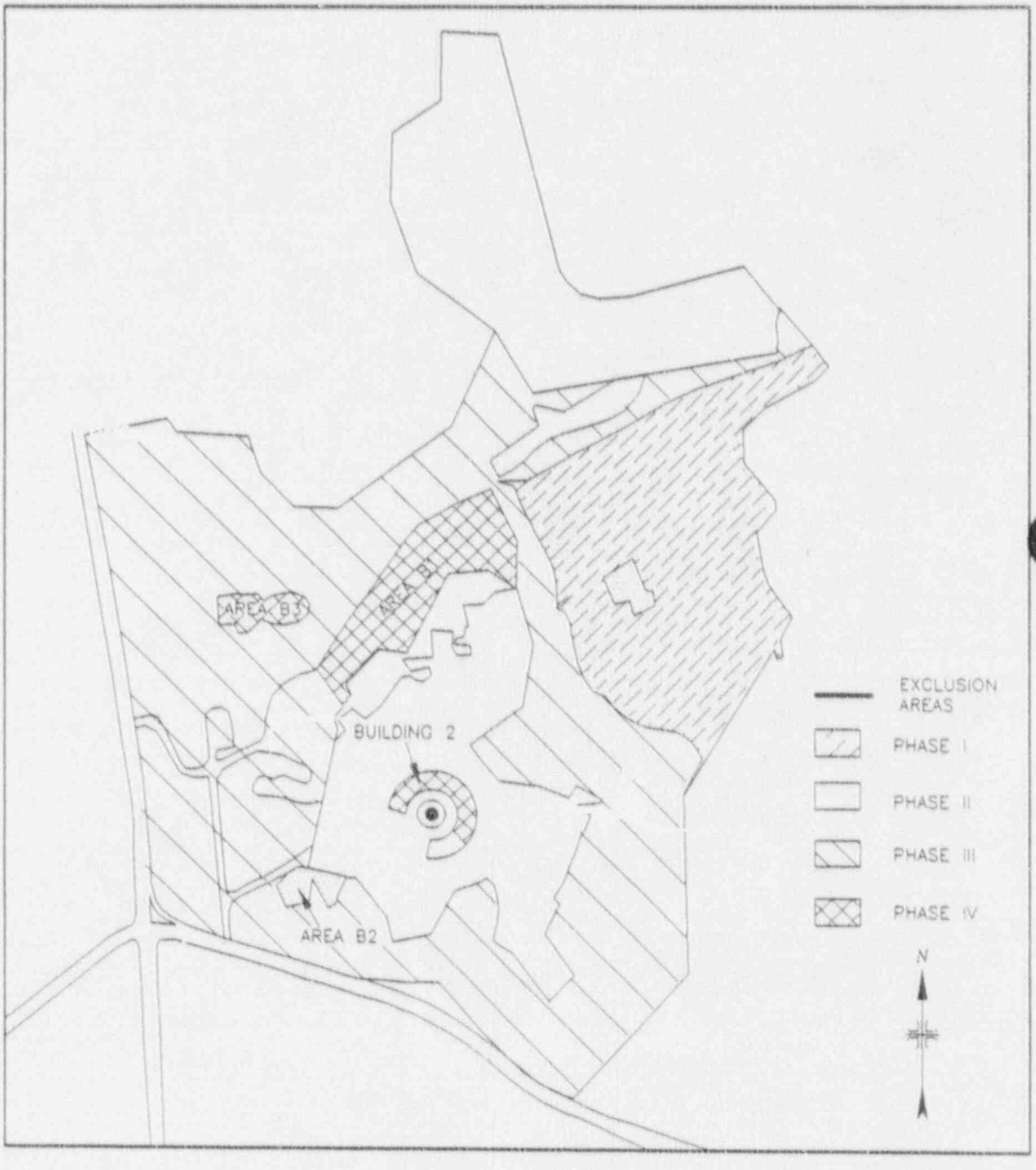

FIGURE 3: Areas Included in Various Decommissioning Phases

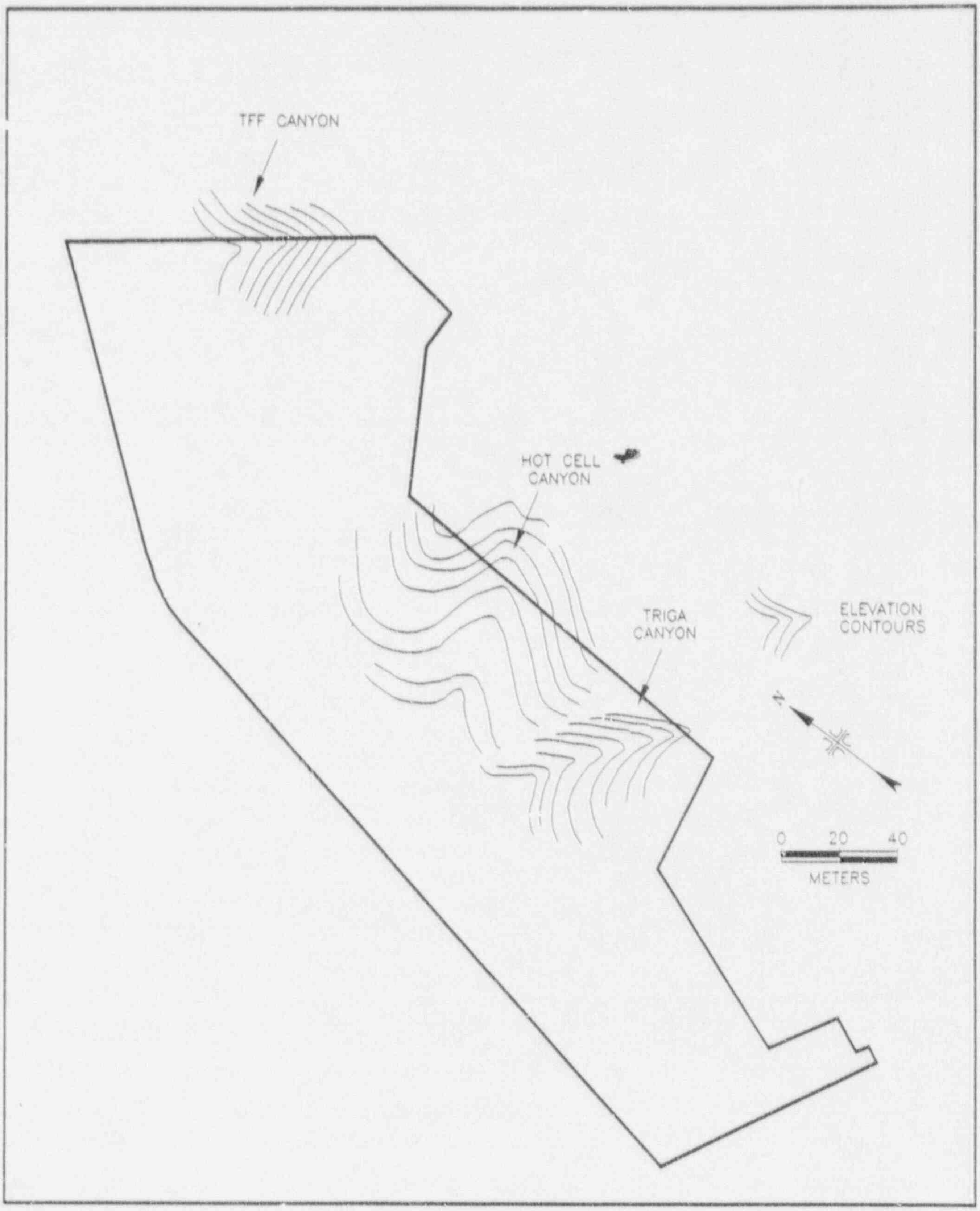

FIGURE 4: Plan View of Area B1

GAT28

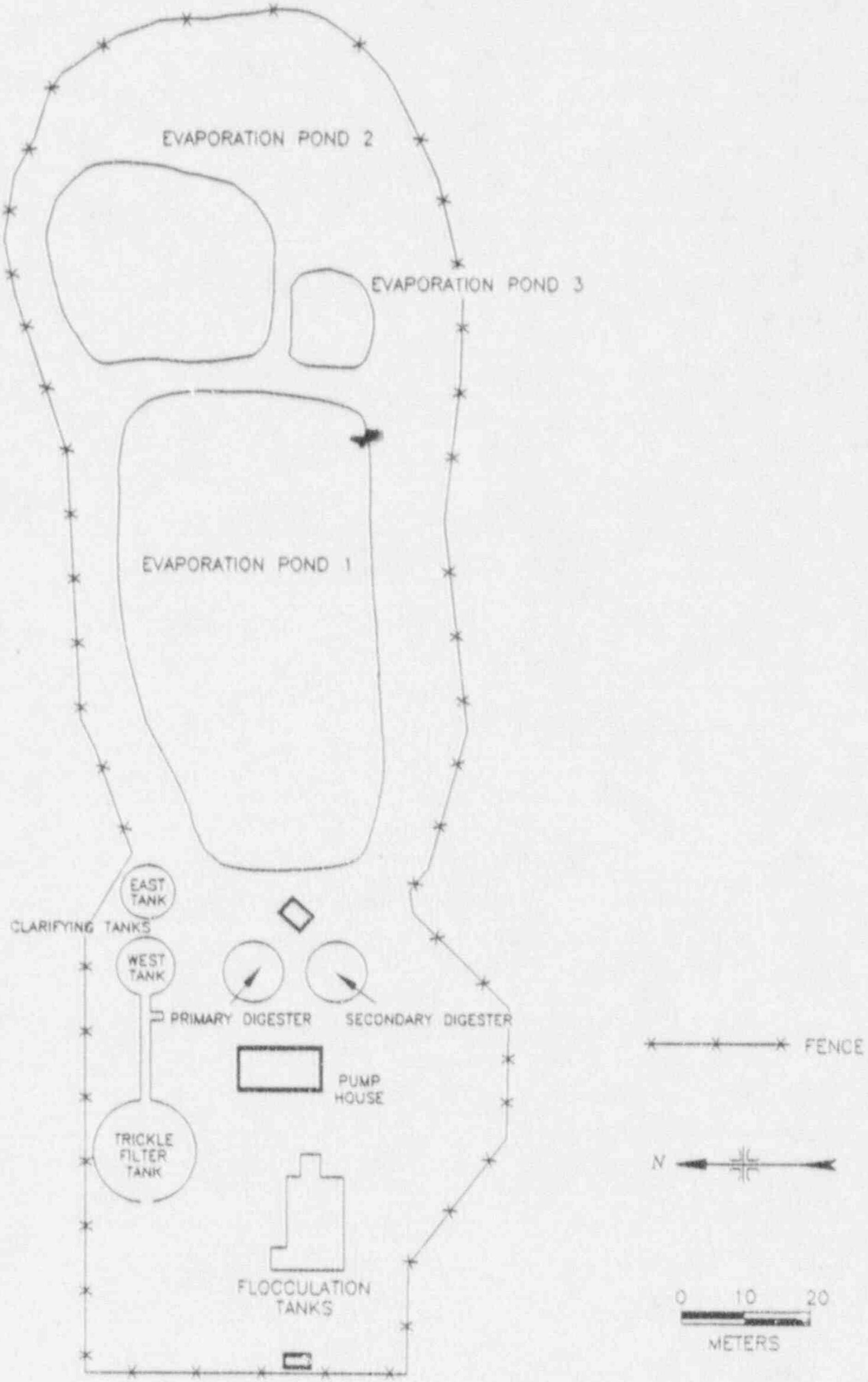

FIGURE 5: Plan View of Area B3 "Callan Ponds"

GAT25

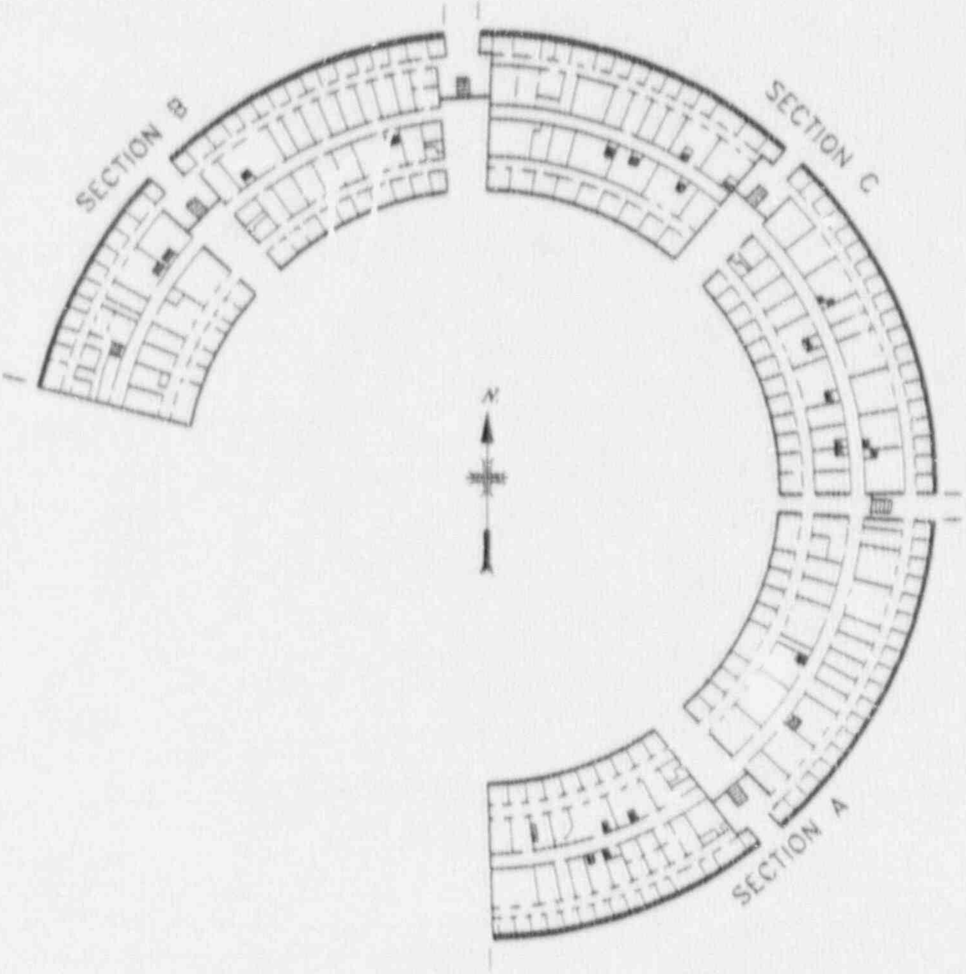

FIGURE 6: Layout of Building 2 (L Building Comple

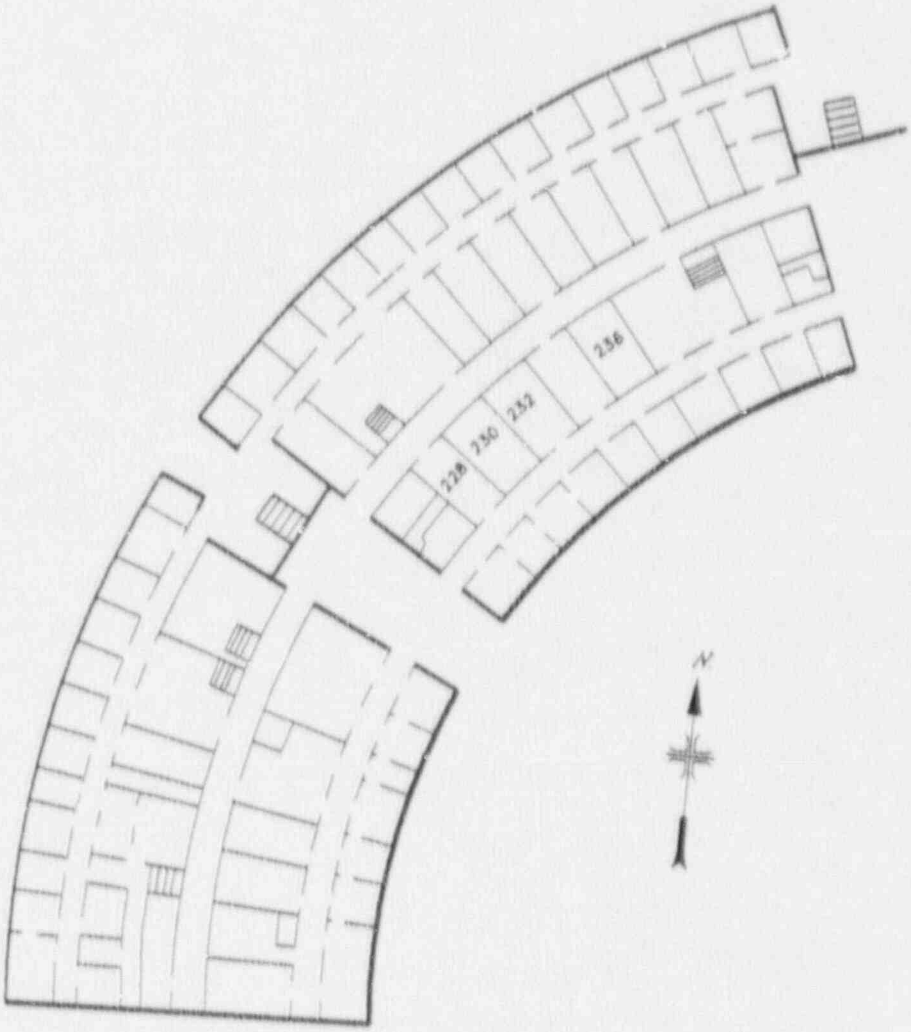

FIGURE 7: Section B of Building 2, Indicating Rooms Included in Phase IV Decommissioning

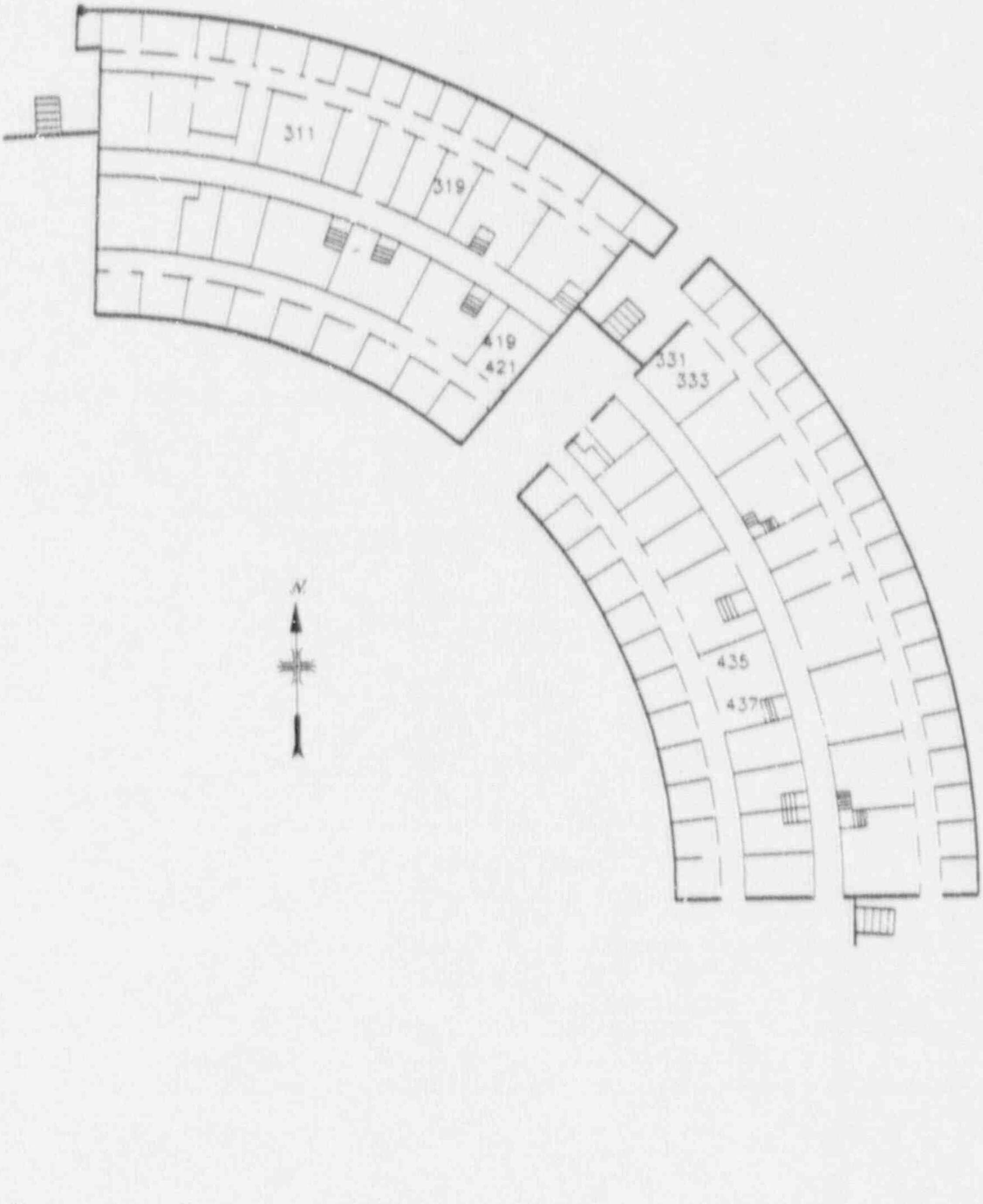

FIGURE 8: Section C of Building 2, Indicating Rooms Included in Phase IV Decommissioning

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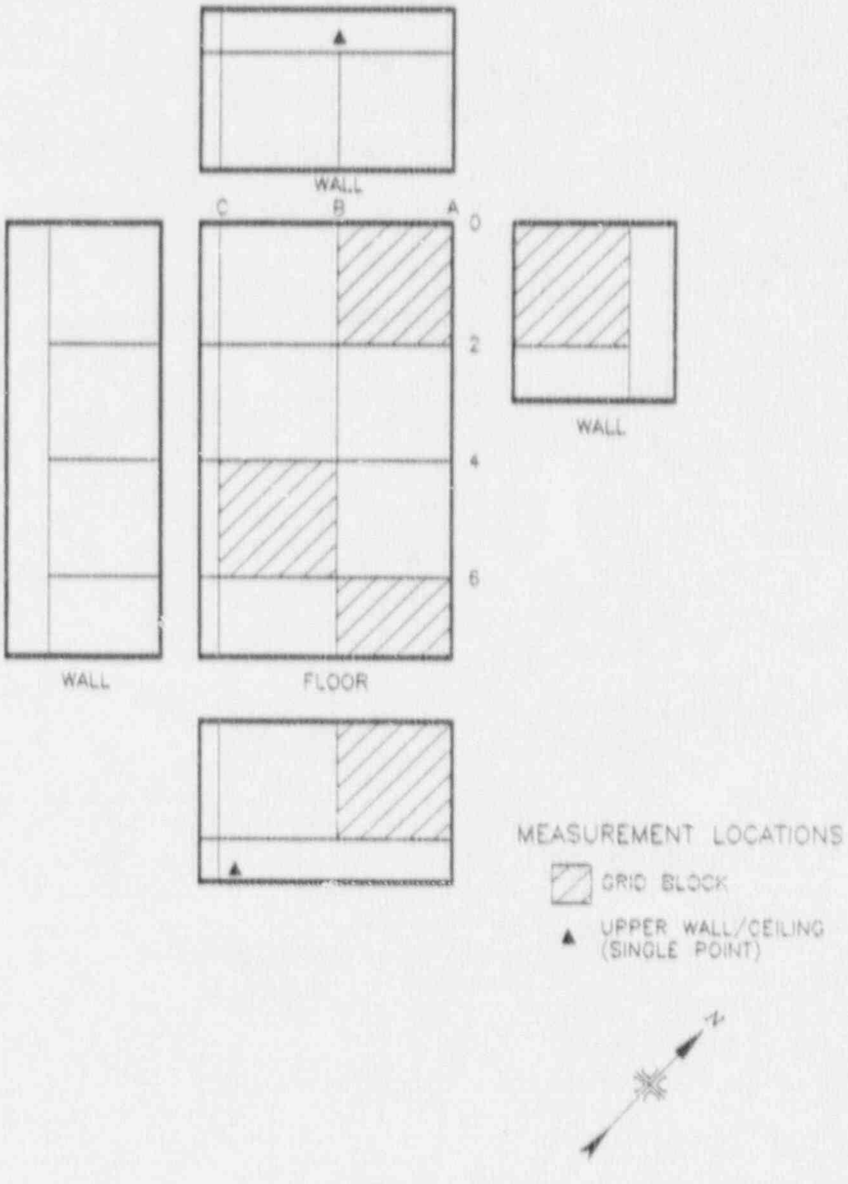

FIGURE 9: Layout of Room 228, Indicating Locations of Surface Contamination Measurements

GAT33

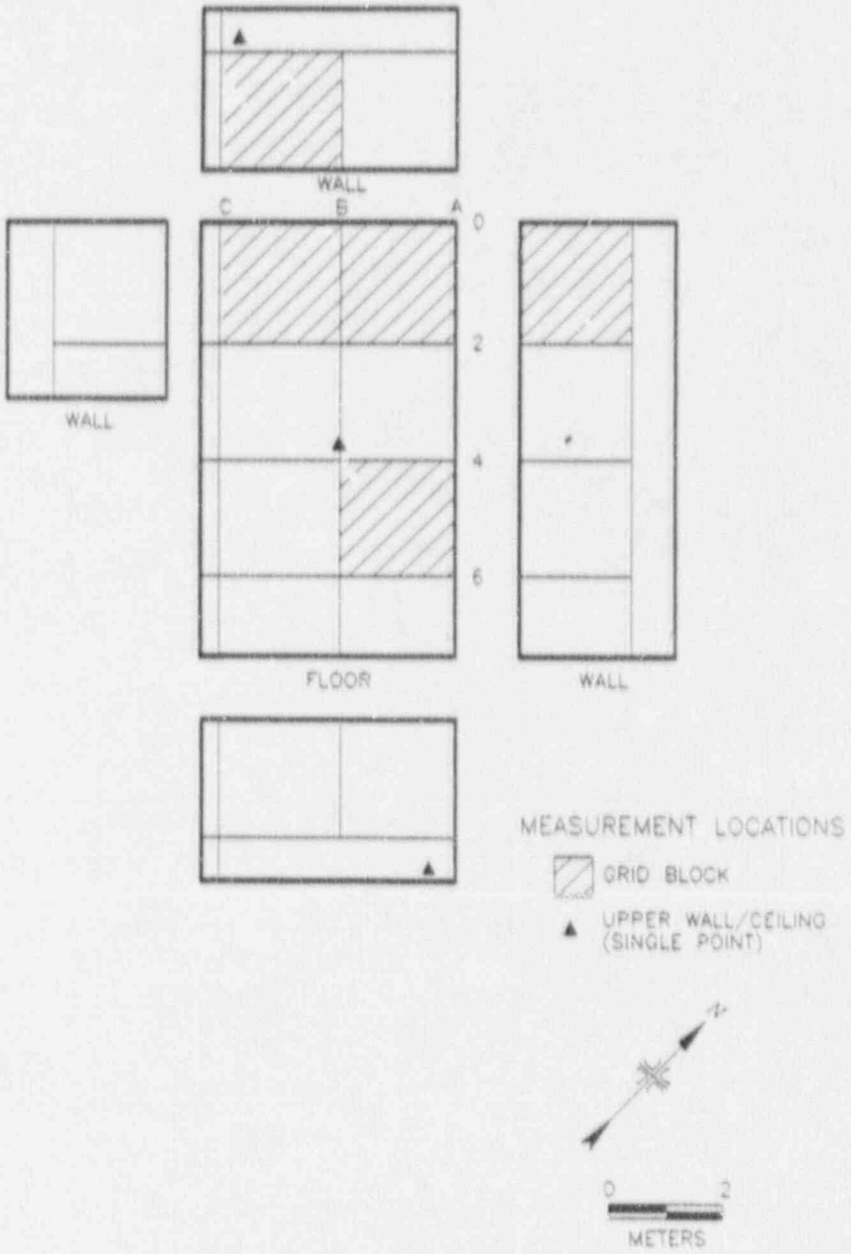

FIGURE 10: Layout of Room 230, Indicating Locations of Surface Contamination Measurements

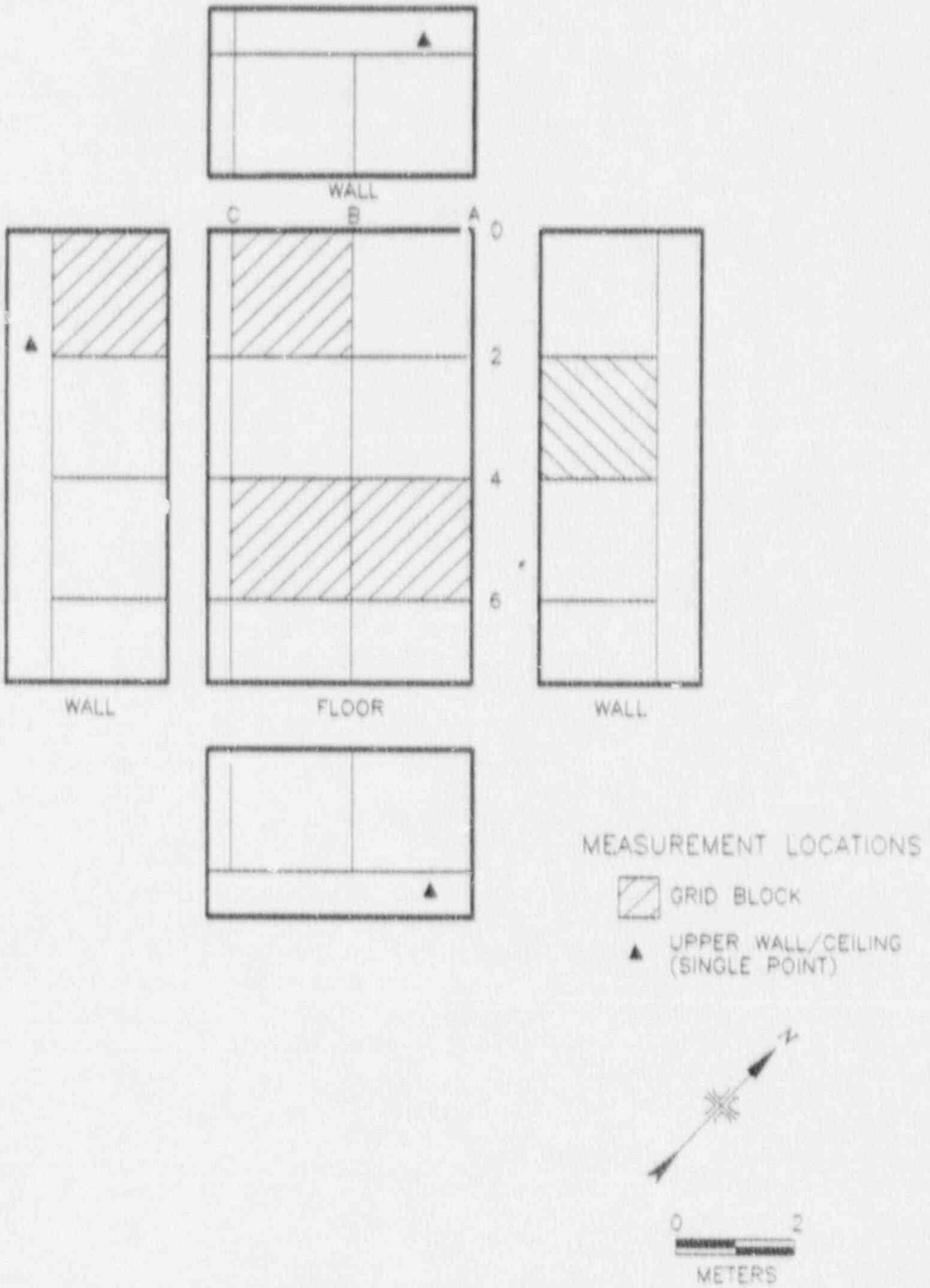

FIGURE 11: Layout of Room 232, Indicating Locations of Surface Contamination Measurements

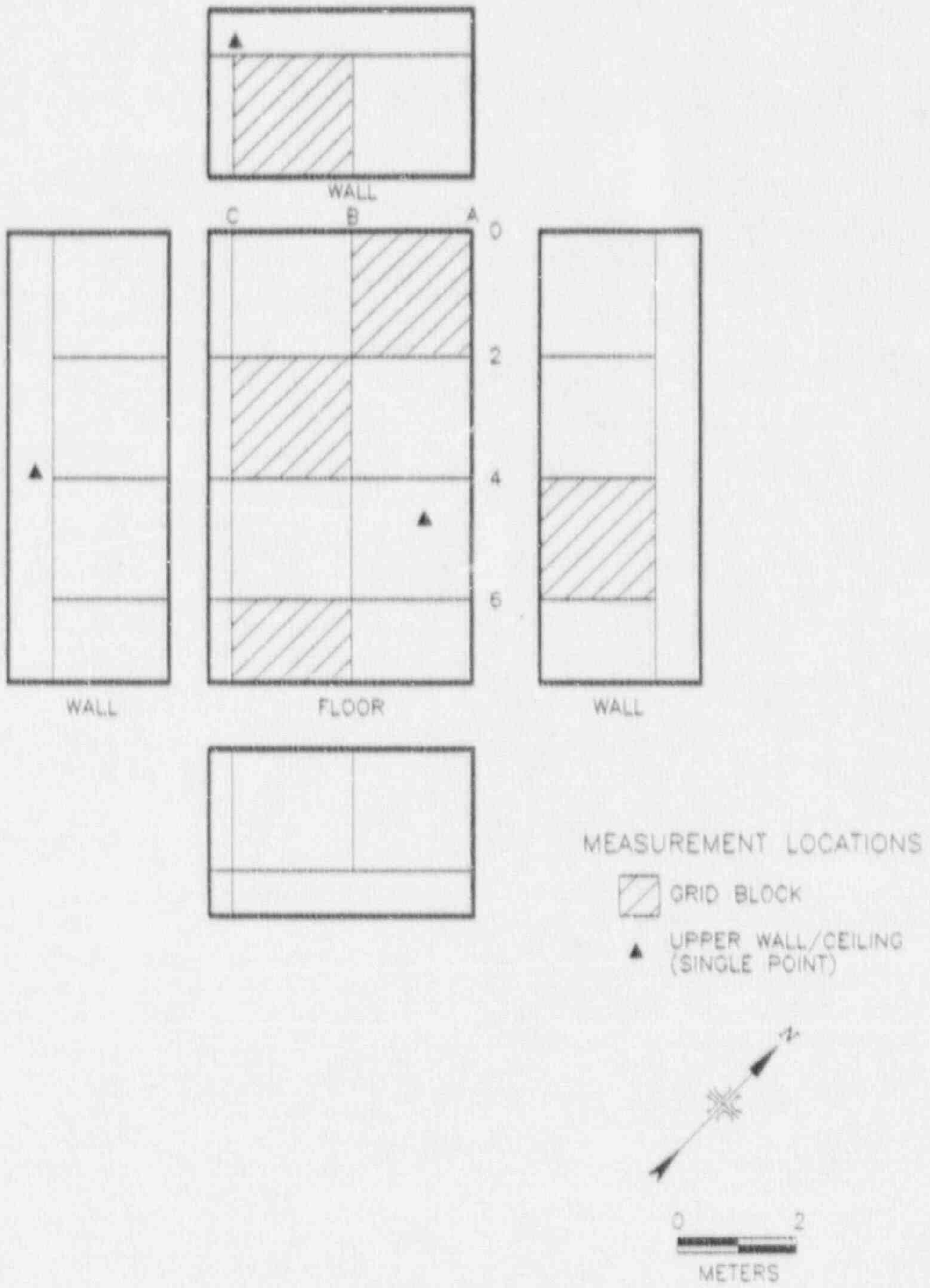

FIGURE 12: Layout of Room 236, Indicating Locations of Surface Contamination Measurements

GAT19

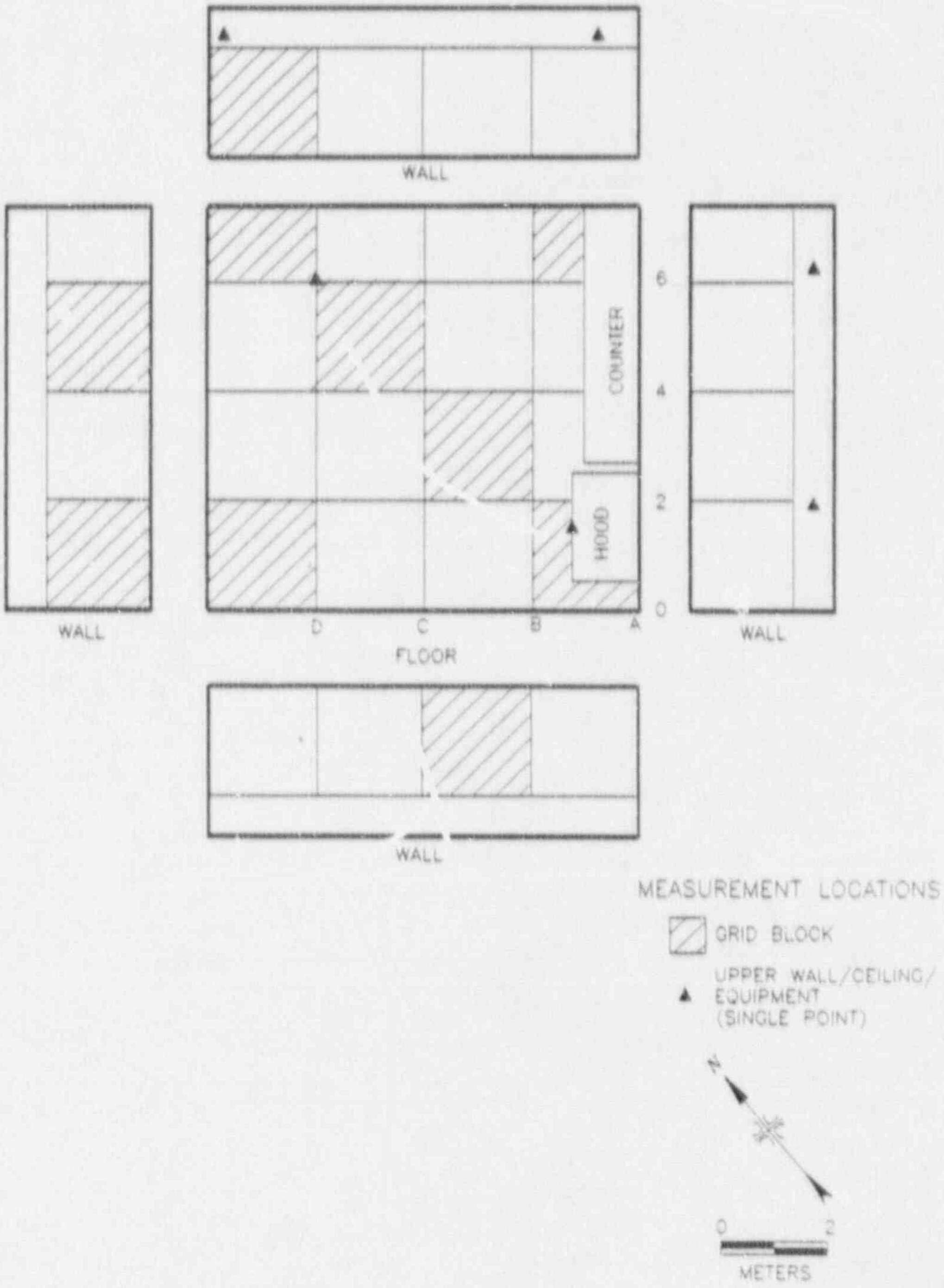

FIGURE 13: Layout of Room 311, Indicating Locations of Surface Contamination Measurements

GAT20

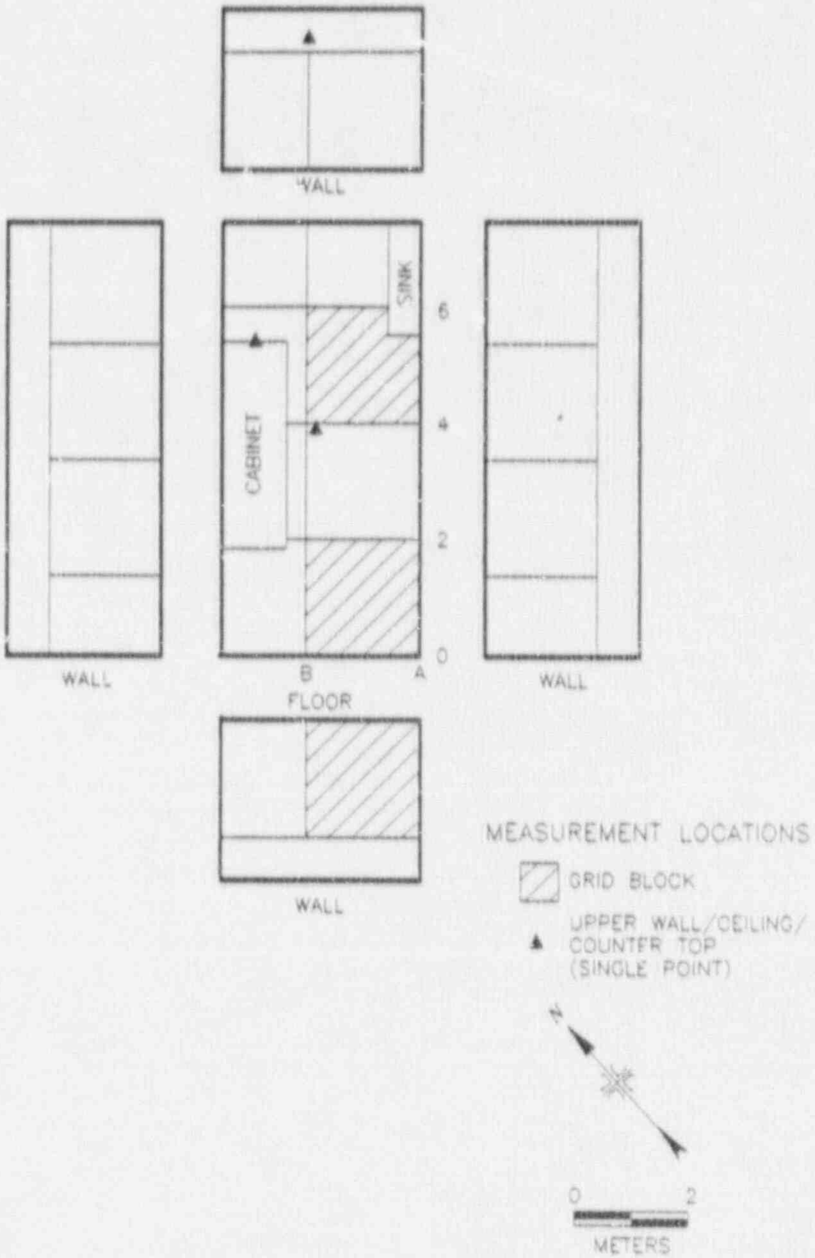

FIGURE 14: Layout of Room 319, Indicating Locations of Surface Contamination Measurements

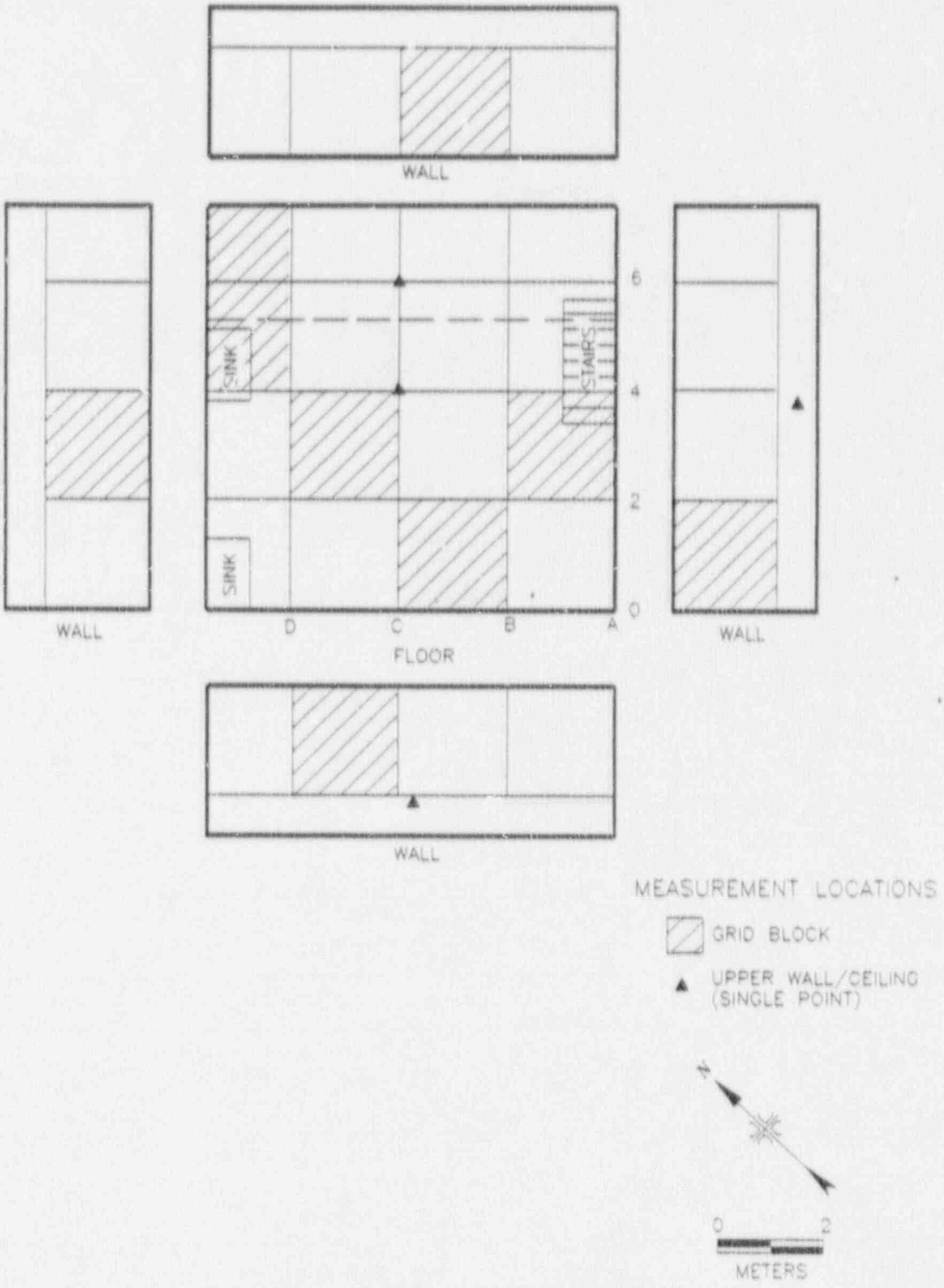

FIGURE 15: Layout of Room 331/333, Indicating Locations of Surface Contamination Measurements

GAT31

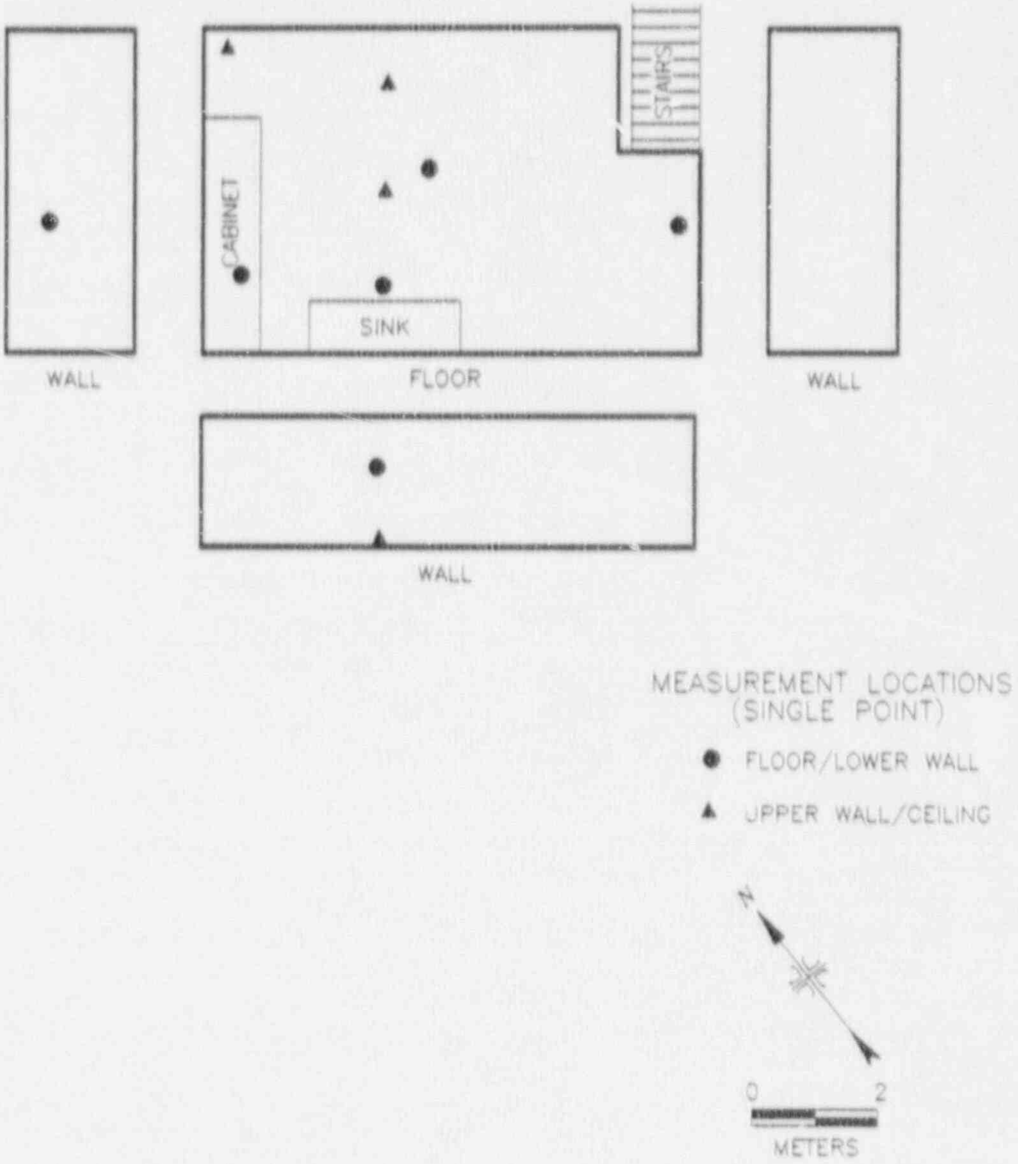

FIGURE 16: Layout of Room 331/333, Mezzanine, Indicating Locations of Surface Contamination Measurements

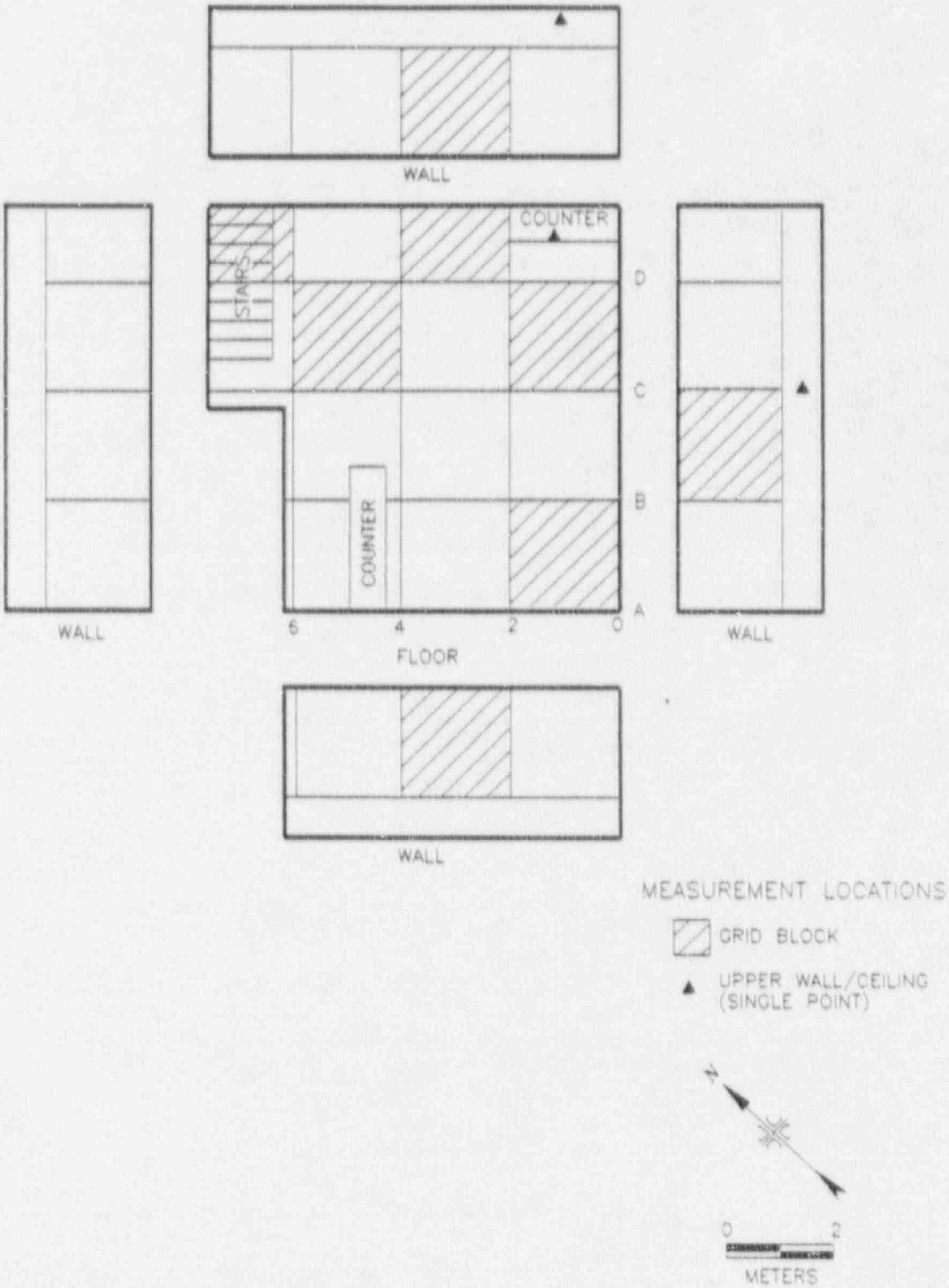

FIGURE 17: Layout of Room 419/421, Indicating Locations of Surface Contamination Measurements

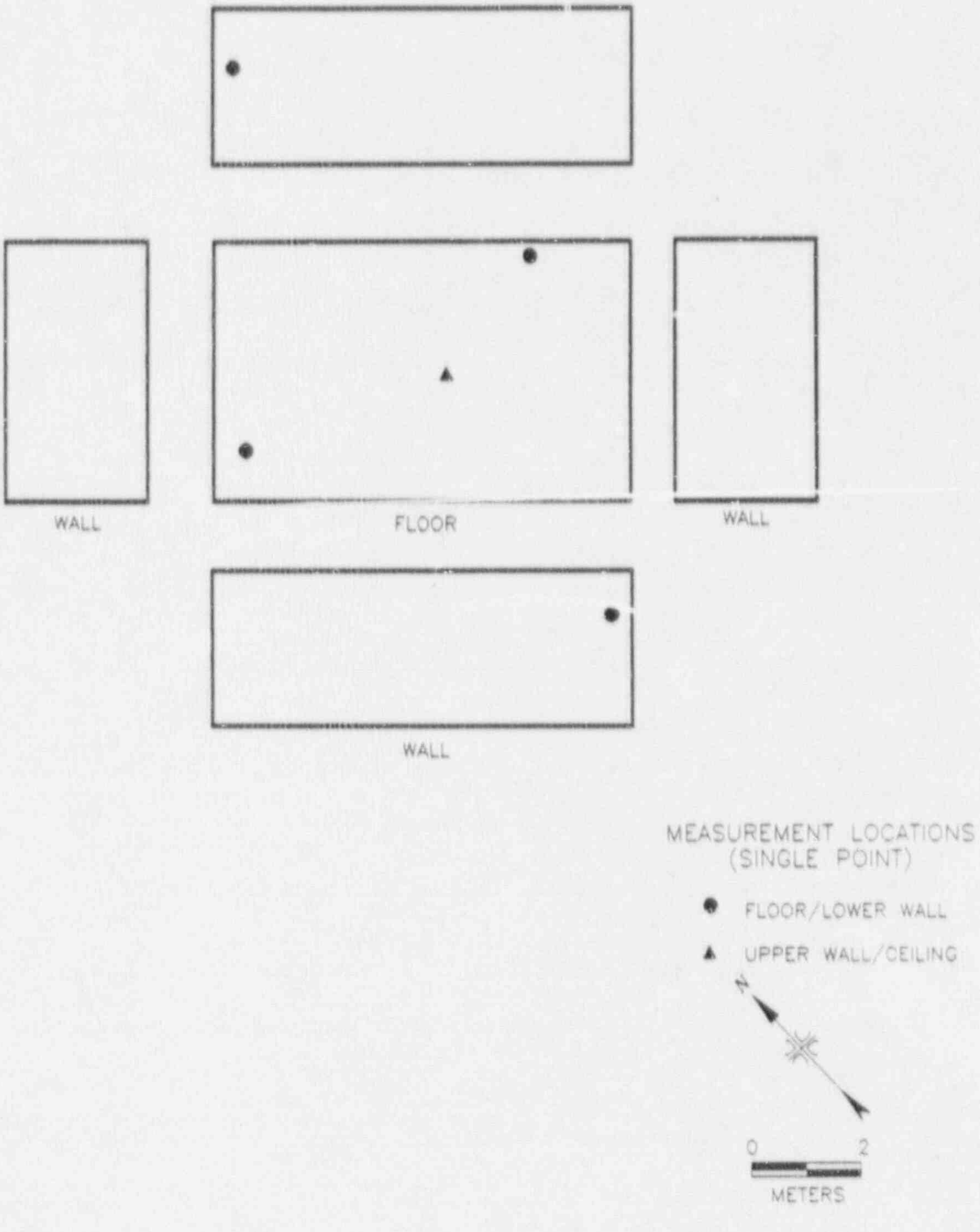

FIGURE 18: Layout of Room 419/421 Mezzanine, Indicating Locations of Surface Contamination Measurements

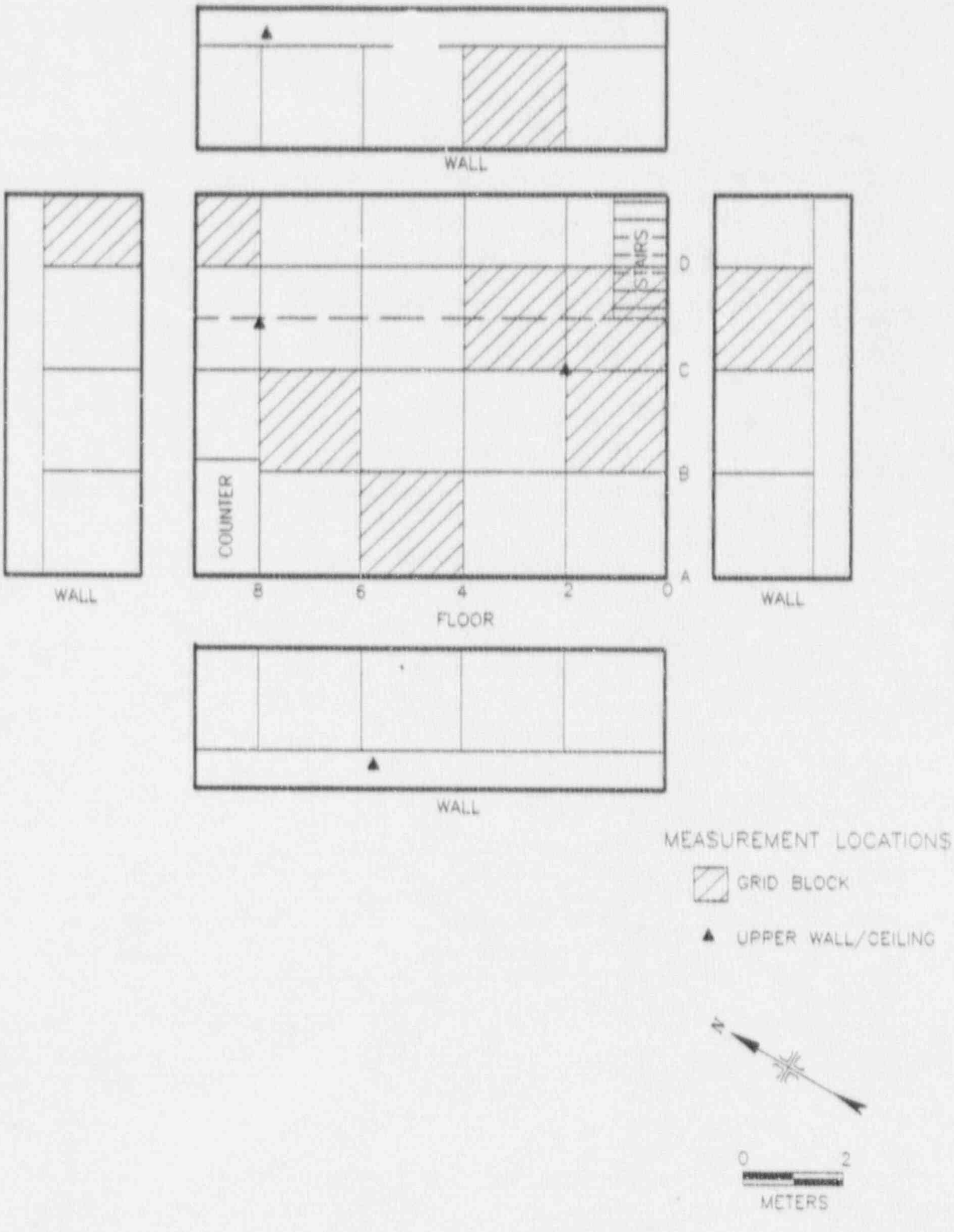

FIGURE 19: Layout of Room 435/437, Indicating Locations of Surface Contamination Measurements

GAT32

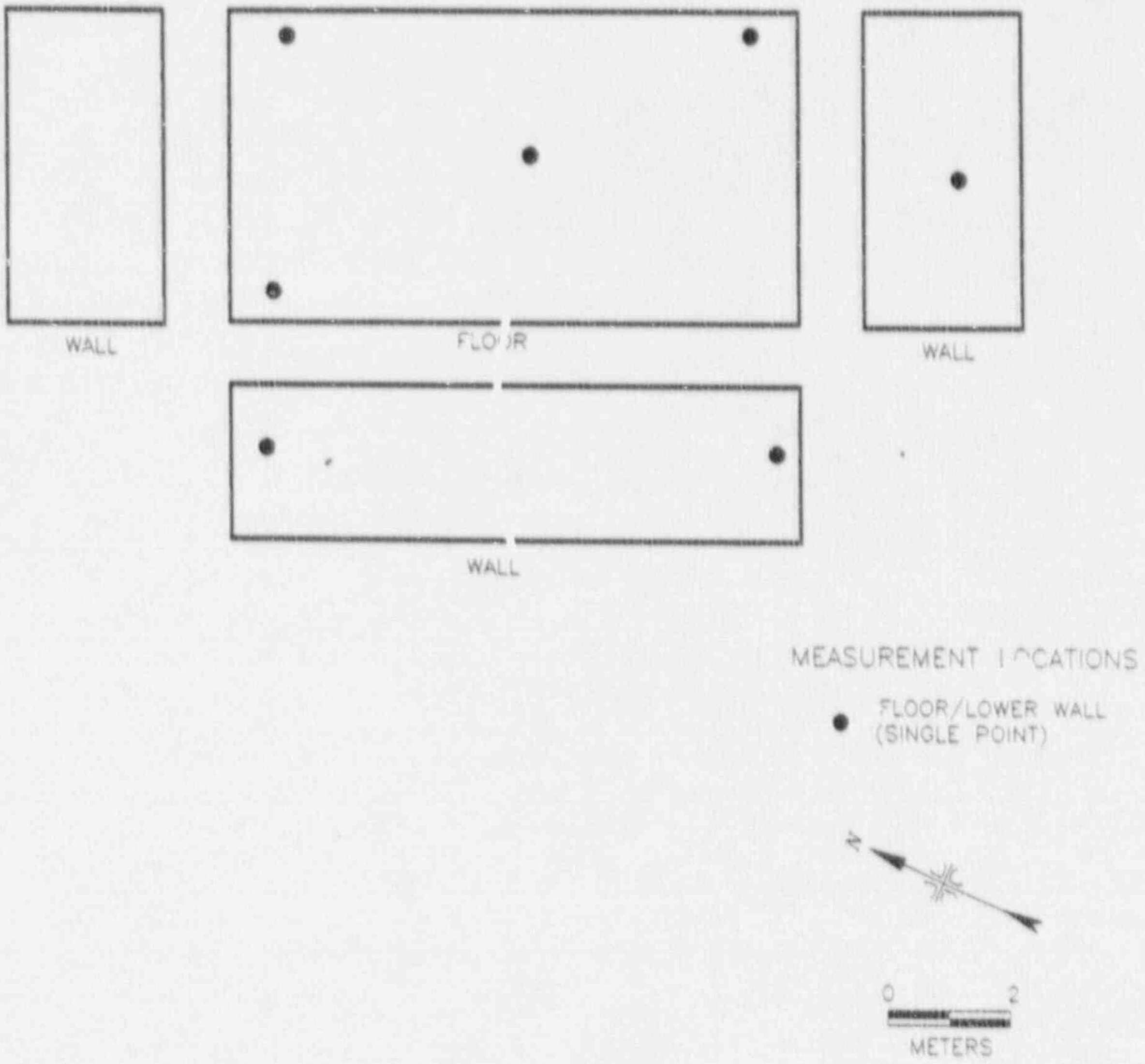

FIGURE 20: Layout of Room 435/437 Mezzanine, Indicating Locations of Surface Contamination Measurements

GAT29

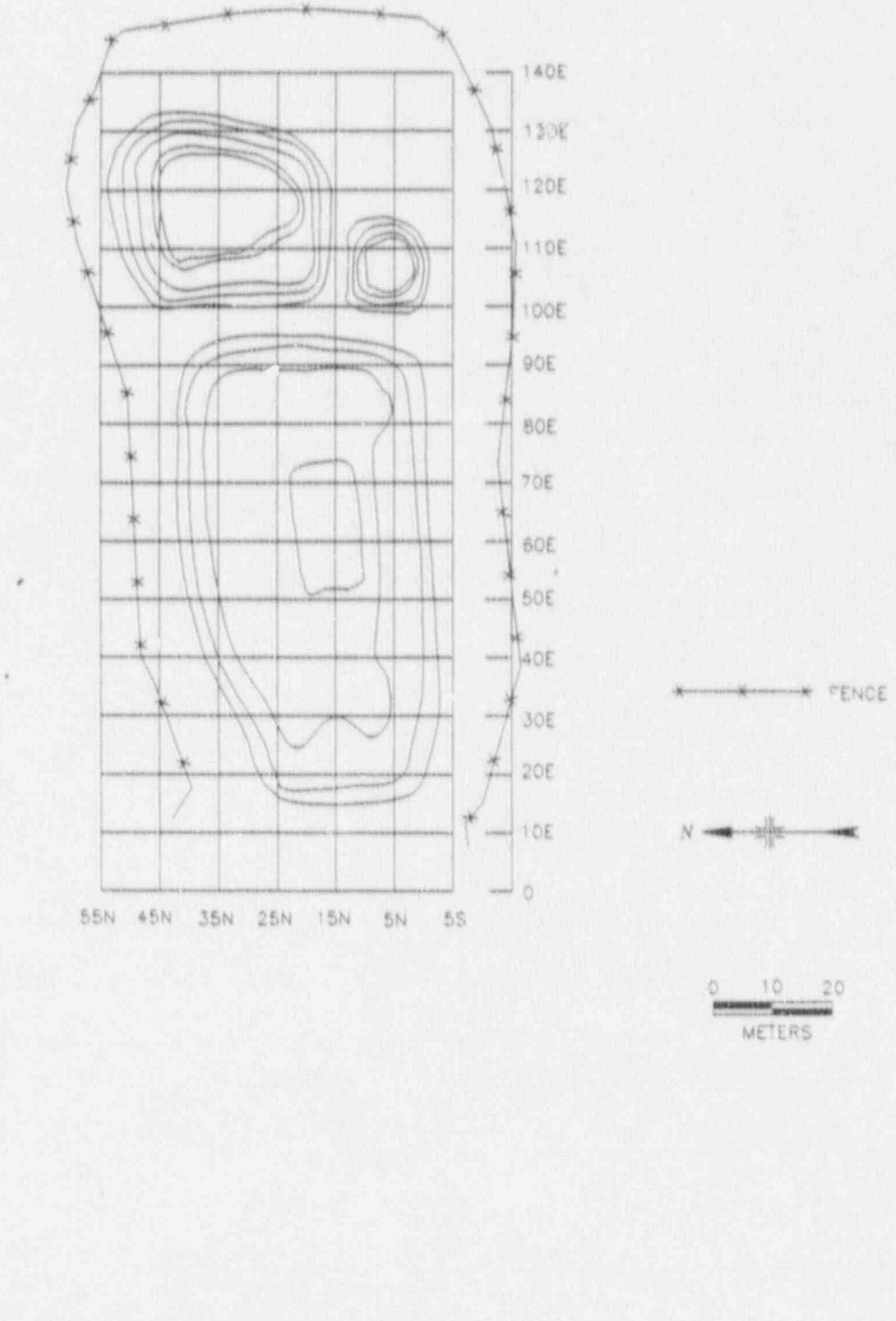

FIGURE 21: Callan Ponds, Area B3, Indicating the 10 m Grid System For Survey Reference

GAT28a

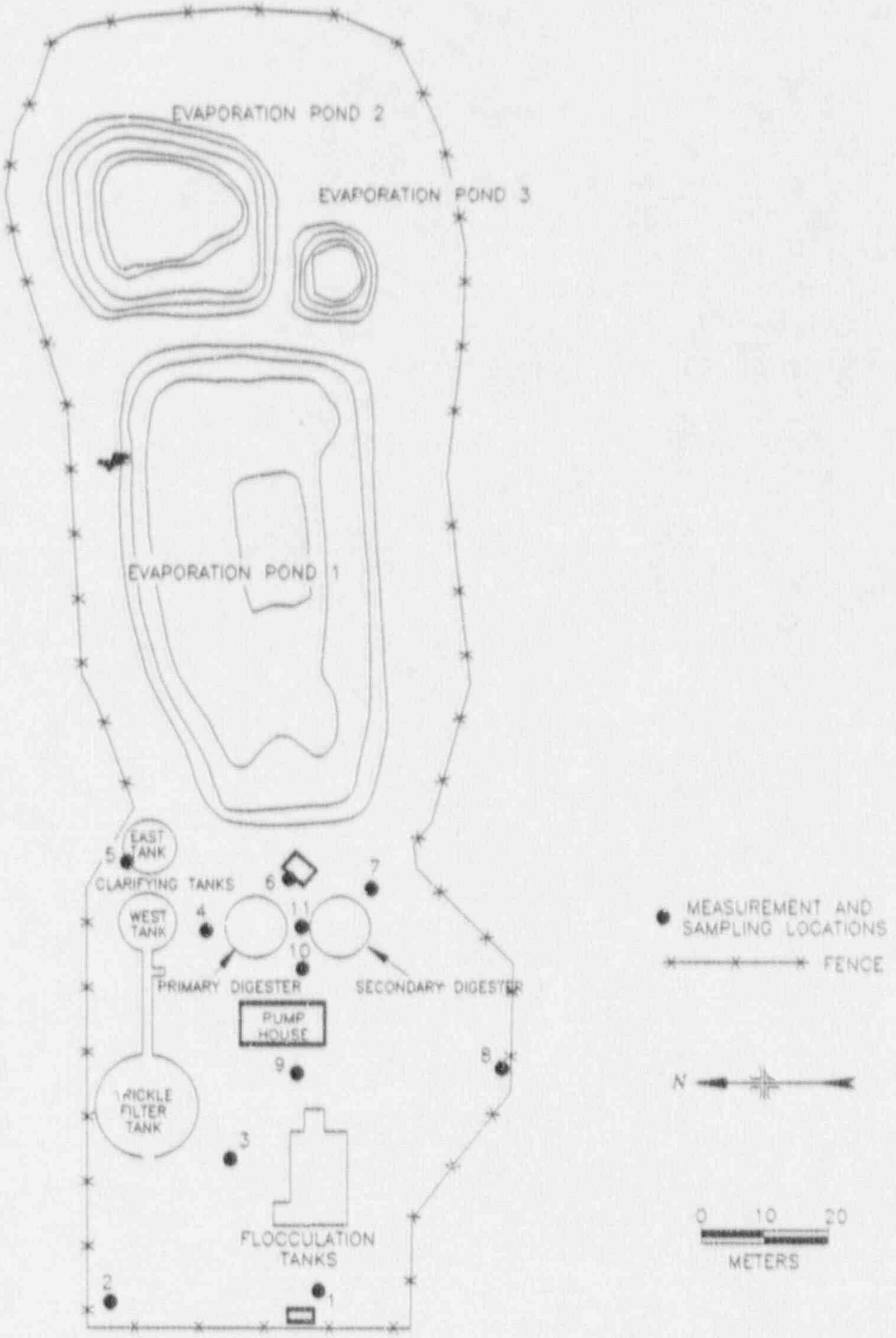

FIGURE 22: Locations of Measurements and Sampling from the Ungridded Portion of Area B3

GAT24a

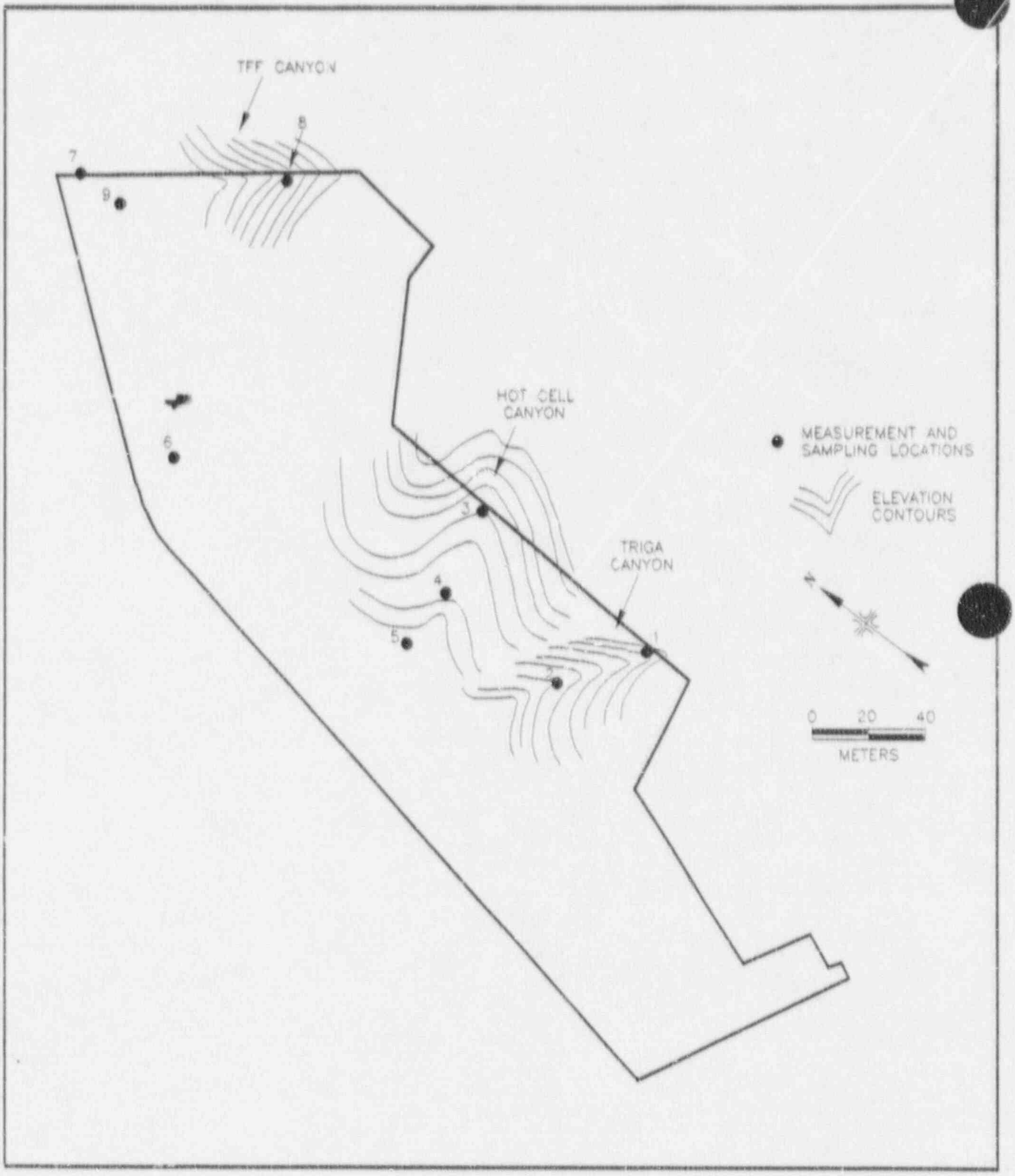

FIGURE 23: Area B1 Indicating Locations of Measurements and Sampling

GAT29o

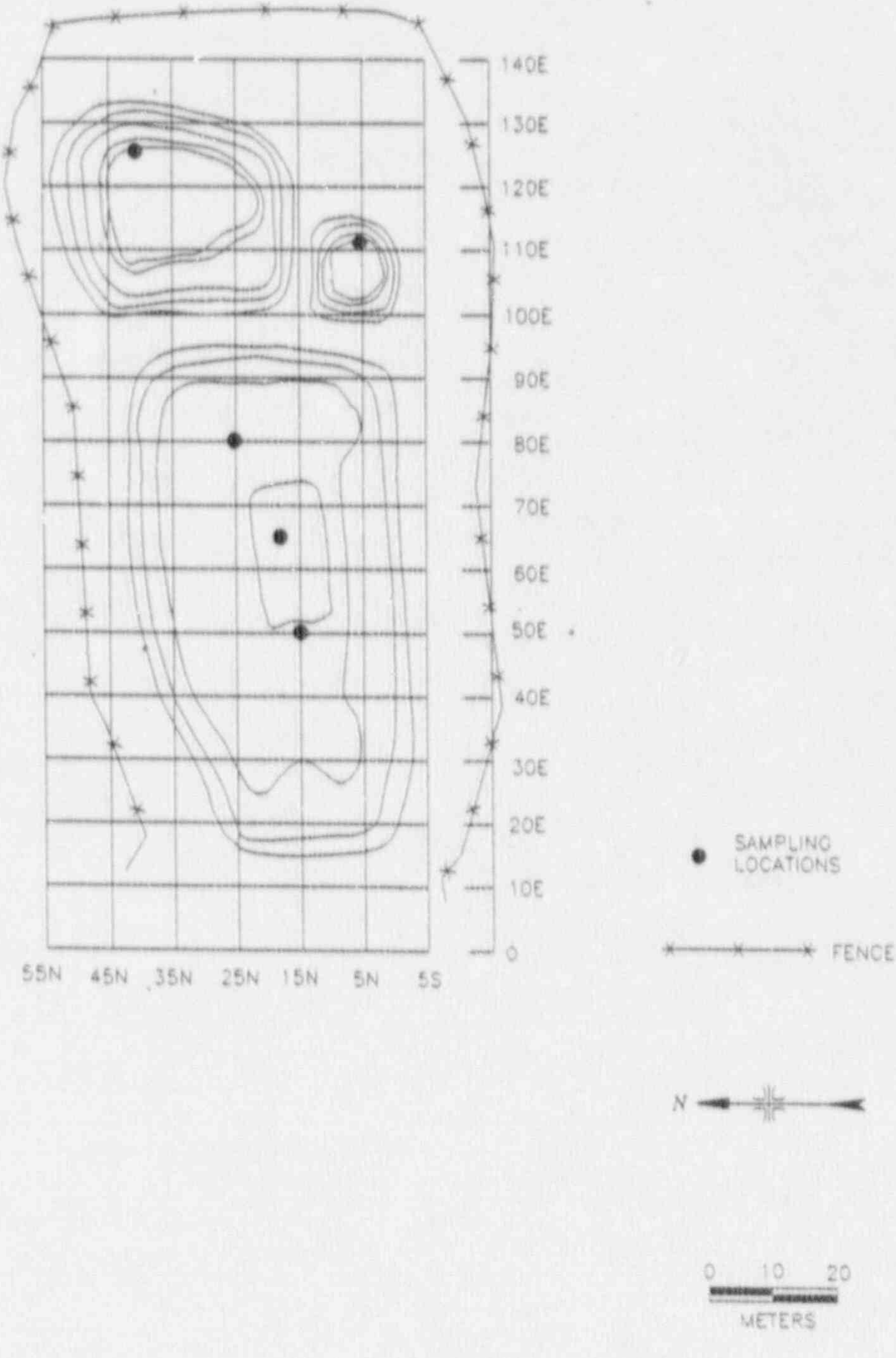

FIGURE 24: Subsurface Soil Sampling Locations, Callan Ponds, Area B3

GAT4 a

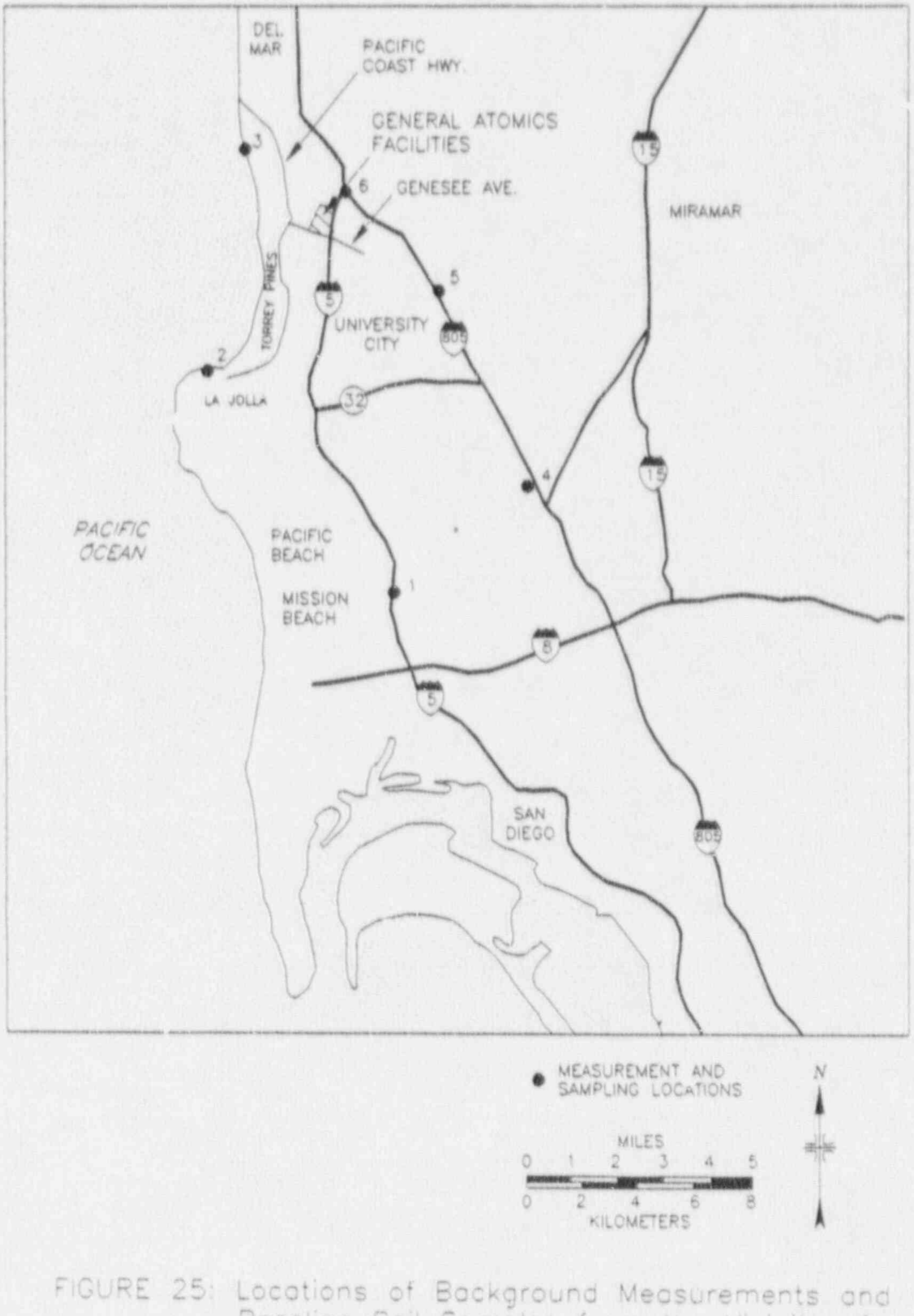

FIGURE 25: Locations of Background Measurements and Baseline Soil Samples from the Vicinity of General Atomics

TABLE 1

BACKGROUND RADIATION LEVELS
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA[a]

Location[b]	Gamma Exposure Rates at 1 m Above the Surface (μR/h)	Gamma Exposure Rates at the Surface (μR/h)
1	7	8
2	8	8
3	7	7
4	10	10
5	13	15
6	13	15
RANGE	7 to 13	7 to 15
AVERAGE	9.7	10.5

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[a] Follow-up Confirmatory Survey of Phase I Decommissioning Former Waste Processing Facility GA Technologies, San Diego, CA, March, 1988.

[b] Refer to Figure 25.

TABLE 2

BASELINE RADIONUCLIDE CONCENTRATIONS IN SOIL
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA[a]

Location[b]	Radionuclide Concentration (pCi/g)						
	Co-60	Cs-137	U-235	U-238	Th-228	Th-232	K-40
1	<0.1	<0.1	0.6 ± 0.1[c]	<0.2	1.6 ± 1.2	1.3 ± 0.5	14.0 ± 1.7
2	<0.1	0.2 ± 0.1	0.5 ± 0.2	<0.2	1.6 ± 1.5	2.0 ± 0.9	25.0 ± 3.3
3	<0.1	<0.1	0.7 ± 0.2	0.4 ± 0.2	1.1 ± 0.5	2.2 ± 0.6	10.4 ± 1.7
4	<0.1	<0.1	1.2 ± 0.3	<0.3	<1.1	3.1 ± 0.8	29.0 ± 3.4
5	<0.1	<0.1	0.2 ± 0.2	0.7 ± 0.6	1.3 ± 0.6	3.2 ± 0.8	24.3 ± 2.7
6	<0.1	<0.1	0.7 ± 0.2	<0.2	1.0 ± 0.9	1.9 ± 0.8	30.2 ± 2.9
RANGE	<0.1 to <0.1	<0.1 to <0.2	0.5 to 1.2	<0.2 to <0.7	1.1 to 1.6	1.3 to 3.2	0.6 to 30.2
AVERAGE	<0.1	<0.1	0.8	<0.5	1.3	2.3	22.2

[a] Follow-up Confirmatory Survey of Phase I Decommissioning Former Waste Processing Facility GA Technologies, San Diego, CA, March, 1988.

[b] Refer to Figure 25.

[c] Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.

TABLE 3

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or Area[a]	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)		Areas Exceeding Criteria
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta Range	
Laboratory Section B									
228	Floor/Lower Wall[b]	5	27	<470	<25- 30	<470- 510	<3	<6	
	Upper Wall/Ceiling[c]	2	N/A	N/A	45	<470	<3	<6	
230	Floor/Lower Wall[b]	5	32	570	<25- 40	<450- 570	<3	<6	
	Upper Wall/Ceiling[c]	3	N/A	N/A	30-110	<470	<3	<6	
232	Floor/Lower Wall[b]	5	53	730	<21- 45	<420- 730	<3	<6	
	Upper Wall/Ceiling[c]	3	N/A	N/A	<25- 40	<470	<3	<6	
236	Floor/Lower Wall[b]	5	28	16000	<21- 31	<420- 62000	<3-16	<6-12	
	Upper Wall/Ceiling[c]	3	N/A	N/A	<21- 74	<420	<3	<6-41	
Laboratory Section C									
311	Floor/Lower Wall[b]	10	64	980	<21- 64	<450- 1200	<3	<6- 8	
	Floor[c]	2	N/A	N/A	<21- 50	<450	<3	<6	
	Upper Wall/Ceiling[c]	6	N/A	N/A	<25- 36	<500	<3	<6- 7	
	Equipment (Hood)[c]	2	N/A	N/A	230	110000[d]	-	-	1
319	Floor/Lower Wall[b]	4	37	820	<21- 53	<490- 870	<3	<6- 9	
	Upper Wall/Ceiling[c]	3	N/A	N/A	<25- 27	<500	<3	<6- 7	
	Floor[c]	1	N/A	N/A	21	<490	<3	<6	

TABLE 3 (Continued)

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

		# of Grid Blocks or	Highest Grid Block Average		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)		Areas Exceeding
Room or Area[a]	Location	Locations Measured	Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta Range	Criteria
331/333[e]	Floor/Lower Wall[b]	9	970	730	<21-2800	<450-920	<3- 5	<6	1
	Upper Wall/Ceiling[c]	5	N/A	N/A	<21- 140	<450	<3	<6-12	0
331/333 Mezzanine	Floor/Lower Wall[c]	7	N/A	N/A	<21- 40	<450- 570	<3	<6	
	Upper Wall/Ceiling[c]	2	N/A	N/A	<21- 120	<450	<3-16	<6	
	Counter tops[c]	7	N/A	N/A	80- 970	<450-24000[d]	<3	<6	4
419/421[e]	Floor/Lower Wall[b]	8	36	<470	<21- 45	<470	<3	<6	
	Upper Wall/Ceiling[c]	3	N/A	N/A	<21- 53	<470	<3	<6	
	Counter Tops[c]	1	N/A	N/A	160	<470	<3	<6	
419/421 Mezzanine[b]	Lower Wall[c]	5	N/A	N/A	<21	<470	<3	<6	
435/437[e]	Floor/Lower Wall[b]	9	44	<600	<21- 62	<500	<3	<6 7	
	Upper Wall/Ceiling[c]	4	N/A	N/A	<21	<500	<3	<6-8	
435/437 Mezzanine[g]	Floor/Lower Wall[c]	7	N/A	N/A	<21	<500	<3	<6	

[a] Refer to Figures 9 through 20.

[b] Five point measurement.

[c] Single point measurement.

[d] Before additional cleanup.

[e] Rooms gridded together.

[f] No samples were collected from the floor - area was carpeted.

[g] Surplus equipment storage area.

TABLE 4

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
FOLLOWING ADDITIONAL CLEANUP OF THE
L BUILDING COMPLEX (BUILDING 2)
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or Area[a]	Location	# of Measurement Locations	Grid Block Average (dpm/100 cm^2)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta Range
Laboratory Section B								
236	Lower Wall	1	<21	740	<21	<420	<3	<6
Laboratory Section C								
311	Equipment (Hood)	1	N/A	N/A	90	500	<3	<6
331/333	Floor/Lower Wall	2	N/A	N/A	850	1200	<3-16	<6
331/333 Mezzanine	Counter Top	3	N/A	N/A	<21-32	<420	<3	<6
Guidelines for Release					5000	5000	1000	1000

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[a] Refer to Figures 12, 13, 15, and 18.

TABLE 5

GAMMA EXPOSURE RATES
MEASURED IN AREA B1
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Gamma Exposure Rate At 1 m Above the Surface (μR/h)	Gamma Exposure Rate At the Surface (μR/h)
1 TRIGA Canyon	20	20
2 TRIGA Canyon	18	18
3 Hot Cell Canyon	25	25
4 Hot Cell Canyon	20	20
5 Hot Cell Canyon	20	20
6 East of Culvert	18	18
7 End of Access Road	15	15
8 TFF Canyon	22	20
9 TFF Canyon	17	17

[a] Refer to Figure 22.

TABLE 6

GAMMA EXPOSURE RATES AT 10 m GRID INTERVALS IN AREA B3 PHASE IV DECOMMISSIONING GENERAL ATOMICS SAN DIEGO, CALIFORNIA

Location[a]	Gamma Exposure Rate at 1 m above the surface (μR/h)	Gamma Exposure Rate at the surface (μR/h)
5N, 0E	12	12
5N, 10E	13	13
5N, 20E	13	13
5N, 30E	13	13
5N, 40E	12	13
5N, 50E	12	11
5N, 60E	12	12
5N, 70E	12	13
5N, 80E	13	13
5N, 90E	11	11
5N,100E	13	13
5N,110E	13	13
5N,120E	-[b]	-
5N,125E	13	14
15N, 0E	13	13
15N, 10E	13	13
15N, 20E	15	15
15N, 30E	15	15
15N, 40E	15	17
15N, 50E	15	15
1[illegible] 60E	15	15
15N, 70E	15	15
15N, 80E	13	13
15N, 90E	13	13
15N,100E	13	13
15N,110E	15	15
15N,120E	15	15
15N,130E	-	-
25N, 0E	12	12
25N, 10E	13	13
25N, 20E	13	12
25N, 30E	13	13
25N, 40E	13	15
25N, 50E	13	15
25N, 60E	15	15
25N, 70E	15	15
25N, 80E	13	13
25N, 90E	13	13
25N,100E	13	15

TABLE 6 (Continued)

GAMMA EXPOSURE RATES AT
10 m GRID INTERVALS IN AREA B3
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Gamma Exposure Rate at 1 m above the surface (μR/h)	Gamma Exposure Rate at the surface (μR/h)
25N,110E	15	15
25N,120E	15	15
25N,130E	13	13
35N, 0E	13	13
35N, 10E	13	13
35N, 20E	13	13
35N, 30E	12	13
35N, 40E	13	15
35N, 50E	13	13
35N, 60E	13	13
35N, 70E	15	13
35N, 80E	15	15
35N, 90E	11	11
35N,100E	15	15
35N,110E	15	15
35N,120E	17	17
35N,130E	13	13
45N, 0E	11	11
45N, 10E	11	13
45N, 30E	-	-
45N, 40E	-	-
45N, 50E	-	-
45N, 60E	-	-
45N, 70E	-	-
45N, 80E	-	-
45N, 90E	13	13
45N,100E	12	12
45N,110E	15	15
45N,120E	16	17
45N,130E	15	15
45N,145E	13	13
5S, 0E	-	-
5S, 10E	-	-
5S, 20E	11	11
5S, 30E	12	12
5S, 40E	11	11
5S, 50E	-	-
5S, 60E	11	11

TABLE 6 (Continued)

GAMMA EXPOSURE RATES AT
10 m GRID INTERVALS IN AREA B3
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location	Gamma Exposure Rate at 1 m above the surface (μR/h)	Gamma Exposure Rate at the surface (μR/h)
5S, 70E	-	-
5S, 80E	-	-
5S, 90E	-	-
5S,100E	17	17

[a] Refer to Figure 21.

[b] Dash indicates measurement not performed, due to inaccessibility of location.

TABLE 7

GAMMA EXPOSURE RATES IN UNGRIDDED PORTIONS OF AREA B3
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Locations[a]	Gamma Exposure Rate At 1 m Above the Surface (μR/h)	Gamma Exposure Rate At the Surface (μR/h)
1	11	12
2	11	11
3	12	12
4	12	13
5	12	12
6	13	13
7	12	12
8	11	11
9	10	20
10	12	12
11	17	18

[a] Refer to Figure 22.

TABLE 8

RADIONUCLIDE CONCENTRATIONS IN SOIL FROM AREA B1
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Radionuclide Concentration (pCi/g)					
	Co-60	Cs-137	U-235	U-238	Th-228	Th-232
1 TRIGA Canyon under Linac DS603	<0.1	<0.1	<0.2	0.8 ± 0.5[b]	0.5 ± 0.1	1.6 ± 0.3
2 40m Down From DS603	<0.1	0.2 ± 0.1	<0.3	<1.0	0.6 ± 0.1	1.9 ± 0.4
3 Hot Cell Under Linac	<0.1	0.1 ± 0.1	<0.3	1.4 ± 0.8	0.4 ± 0.1	<0.4
4 Hot Cell Canyon	<0.1	0.4 ± 0.1	<0.3	1.7 ± 0.5	0.5 ± 0.1	1.5 ± 0.4
5 Hot Cell Canyon, Bottom	<0.1	2.2 ± 0.1	<0.3	0.7 ± 0.7	0.6 ± 0.1	1.5 ± 0.4
6 East End of Culvert & Main Canyon	<0.1	<0.3	<0.2	1.2 ± 0.2	0.1 ± 0.1	0.4 ± 0.1
7 East End of Access Road	<0.1	0.1 ± 0.1	<0.2	1.0 ± 0.6	0.4 ± 0.1	0.9 ± 0.2
8 TFF Canyon	<0.1	<0.1	<0.3	<0.9	0.6 ± 0.1	1.6 ± 0.3
9 TFF Canyon	<0.1	<0.1	<0.2	1.0 ± 0.3	0.4 ± 0.1	1.0 ± 0[illegible]

[a] Refer to Figure 23.

[b] Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.

TABLE 9

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL
FROM AREA B3
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Radionuclide Concentration (pCi/g)					
	Co-60	Cs-137	U-235	U-238	Th-228	Th-232
5N, 0	<0.1	0.1 ± 0.1	0.1 ± 0.2	0.7 ± 0.4	0.3 ± 0.1	0.4 ± 0.2
5N, 10E	<0.1	0.2 ± 0.1[b]	<0.2	0.5 ± 0.2	0.4 ± 0.1	1.1 ± 0.2
5N, 20E	<0.1	0.2 ± 0.1	<0.2	1.2 ± 0.7	0.6 ± 0.1	1.4 ± 0.2
5N, 20E	<0.1	<0.1	<0.2	1.2 ± 0.3	0.5 ± 0.1	1.3 ± 0.2
5N, 40E	<0.1	0.1 ± 0.1	<0.2	0.8 ± 0.9	0.4 ± 0.1	<0.3
5N, 50E	<0.1	<0.1	<0.2	0.3 ± 0.5	0.3 ± 0.1	0.7 ± 0.2
5N, 60E	<0.1	0.1 ± 0.1	<0.2	1.3 ± 0.5	0.3 ± 0.1	1.0 ± 0.3
5N, 70E	<0.1	0.3 ± 0.1	0.3 ± 0.2	0.6 ± 0.4	0.4 ± 0.1	1.1 ± 0.2
5N, 80E	<0.1	0.1 ± 0.1	<0.2	1.6 ± 0.3	0.4 ± 0.1	1.3 ± 0.2
5N,100E	<0.1	<0.3	<0.2	1.3 ± 0.5	0.4 ± 0.1	0.9 ± 0.2
5N,110E	<0.1	0.2 ± 0.1	<0.2	0.6 ± 0.9	0.5 ± 0.1	1.2 ± 0.2
5N, 125E	<0.1	0.3 ± 0.1	<0.2	1.1. ± 0.3	0.3 ± 0.1	0.7 ± 0.2
15N, 0E	<0.1	0.1 ± 0.1	<0.2	1.2 ± 0.5	0.4 ± 0.1	1.2 ± 0.2
15N, 10E	<0.1	0.1 ± 0.1	<0.2	1.2 ± 0.6	0.5 ± 0.1	<0.3
15N, 20E	<0.1	0.2 ± 0.1	<0.3	2.1 ± 1.2	0.8 ± 0.1	1.5 ± 0.2
15N, 30E	<0.1	0.1 ± 0.1	<0.2	2.3 ± 0.5	0.7 ± 0.1	1.5 ± 0.3
15N, 40E	<0.1	0.3 ± 0.1	<0.3	5.8 ± 0.5	0.6 ± 0.1	2.3 ± 0.4
15N, 50E	<0.1	0.2 ± 0.1	<0.3	1.4 ± 1.2	0.7 + 0.1	2.0 ± 0.2
15N, 60E	<0.1	0.1 ± 0.1	<0.3	0.6 ± 0.7	0.8 ± 0.1	2.7 ± 0.3
15N, 70E	<0.1	0.1 ± 0.1	<0.3	3.8 ± 0.9	0.5 ± 0.1	1.5 ± 0.3
15N, 80E	<0.1	0.1 ± 0.1	0.3 ± 0.2	1.2 ± 0.8	0.3 ± 0.1	0.9 ± 0.2
15N, 90E	<0.1	<0.1	<0.2	0.8 ± 0.3	0.4 ± 0.1	1.5 ± 0.2
15N,100E	<0.1	0.1 ± 0.1	0.7 ± 0.2	1.4 ± 0.5	0.4 ± 0.1	1.1 ± 0.2
15N,110E	<0.1	0.2 ± 0.1	<0.2	0.5 ± 0.4	0.5 ± 0.1	1.2 ± 0.2
15N,120E	<0.1	0.4 ± 0.1	<0.2	2.2 ± 0.4	0.5 ± 0.1	1.1 ± 0.2
25N, 0E	<0.1	0.1 ± 0.1	<0.2	1.2 ± 0.5	0.3 ± 0.1	0.6 ± 0.3
25N, 10E	<0.1	0.1 ± 0.1	<0.2	0.7 ± 0.3	0.3 ± 0.1	1.5 ± 0.2
25N, 20E	<0.1	0.2 ± 0.1	<0.2	2.3 ± 0.3	0.4 ± 0.1	1.0 ± 0.2
25N, 20E	<0.1	0.5 ± 0.1	<0.3	0.7 ± 0.4	0.4 ± 0.1	1.3 ± 0.2
25N, 40E	<0.1	<0.1	<0.2	2.7 ± 0.3	0.3 ± 0.1	1.0 ± 0.2
25N, 50E	<0.1	0.3 ± 0.1	<0.2	1.6 ± 0.4	0.4 ± 0.1	1.0 ± 0.2
25N, 60E	<0.1	<0.1	<0.3	1.1 ± 0.5	0.7 ± 0.1	2.0 ± 0.2
25N, 70E	<0.1	0.1 ± 0.1	<0.3	1.7 ± 0.3	0.5 ± 0.1	1.3 ± 0.2
25N, 80E	<0.1	0.1 ± 0.1	<0.3	1.7 ± 0.6	0.4 ± 0.1	<0.3
25N, 90E	<0.1	<0.1	<0.2	1.0 ± 0.7	0.3 ± 0.1	<0.3
25N,100E	<0.1	0.2 ± 0.1	<0.3	0.5 ± 0.4	0.2 ± 0.1	1.4 ± 0.2
25N,110E	<0.1	<0.1	<0.3	0.6 ± 0.4	0.7 + 0.1	1.6 ± 0.3
25N,120E	<0.1	0.2 ± 0.1	<0.3	1.5 ± 0.8	0.7 ± 0.1	1.7 ± 0.2
35N, 0E	<0.1	<0.1	<0.2	3.2 ± 1.1	0.3 ± 0.1	1.0 ± 0.2
35N, 10E	<0.1	0.1 ± 0.1	<0.2	1.3 ± 0.3	0.2 ± 0.1	0.9 ± 0.2
35N, 20E	<0.1	0.1 ± 0.1	<0.3	1.3 ± 0.6	0.4 ± 0.1	1.2 ± 0.2
35N, 30E	<0.1	0.7 ± 0.1	0.6 ± 0.3	8.7 ± 1.0	0.5 ± 0.1	1.2 ± 0.2
35N, 40E	<0.1	0.4 ± 0.1	<0.2	0.6 ± 0.7	0.3 ± 0.1	0.5 ± 0.3

TABLE 9 (continued)

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL
FROM AREA B3
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location	Radionuclide Concentration (pCi/g)					
	Co-60	Cs-137	U-235	U-238	Th-228	Th-232
35N, 50E	<0.1	<0.1	<0.2	<0.6	0.3 ± 0.1	0.9 ± 0.2
35N, 60E	<0.1	<0.1	0.8 ± 0.2	3.4 ± 1.0	0.5 ± 0.1	1.3 ± 0.2
35N, 70E	<0.1	0.1 ± 0.1	<0.3	1.9 ± 0.5	0.6 ± 0.1	1.6 ± 0.2
35N, 80E	<0.1	0.1 ± 0.1	<0.3	0.7 ± 1.1	0.4 ± 0.1	<0.3
35N, 100E	0.2 ± 0.1	0.5 ± 0.1	<0.3	4.5 ± 0.9	0.5 ± 0.1	1.6 ± 0.2
35N, 110E	<0.1	0.1 ± 0.1	<0.3	0.8 ± 0.7	0.7 ± 0.1	1.7 ± 0.3
35N, 120E	<0.1	<0.1	<0.4	1.9 ± 0.8	0.6 ± 0.1	1.8 ± 0.3
35N, 130E	<0.1	<0.1	<0.3	1.7 ± 0.6	0.3 ± 0.1	1.0 ± 0.2
45N, 0	<0.1	0.1 ± 0.1	<0.2	<0.7	0.3 ± 0.1	1.0 ± 0.2
45N, 10E	<0.1	<0.1	<0.3	0.6 ± 0.6	0.3 ± 0.1	0.8 ± 0.1
45N, 100E	<0.1	0.3 ± 0.1	<0.2	1.5 ± 0.7	0.3 ± 0.1	0.8 ± 0.2
45N, 110E	<0.1	0.4 ± 0.1	<0.3	3.0 ± 0.8	0.5 ± 0.1	1.2 ± 0.3
45N, 120E	<0.1	2.0 ± 0.1	0.7 ± 0.4	13.0 ± 2.2	0.4 ± 0.1	1.2 ± 0.3
45N, 145E	<0.1	0.1 ± 0.1	<0.2	1.1 ± 0.5	0.3 ± 0.1	<0.3
5S, 40E	<0.1	<0.1	<0.2	<0.5	0.3 ± 0.1	0.7 ± 0.2
5S, 100E	<0.1	<0.1	<0.2	0.4 ± 0.5	0.3 ± 0.1	1.0 ± 0.1
1	<0.1	0.2 ± 0.1	<0.2	0.6 ± 0.6	0.2 + 0.1	0.6 ± 0.2
2	<0.1	0.7 ± 0.1	<0.2	<0.7	0.3 ± 0.1	0.7 ± 0.2
3	<0.1	0.1 ± 0.1	<0.2	1.1 ± 0.6	0.2 ± 0.1	0.7 ± 0.2
4	<0.1	0.2 ± 0.1	<0.3	1.7 ± 0.8	0.4 ± 0.1	0.9 ± 0.2
5	<0.1	0.1 ± 0.1	<0.2	0.4 ± 0.6	0.3 ± 0.1	0.6 ± 0.3
6	0.1 ± 0.1	0.5 ± 0.1	<0.2	0.3 ± 0.8	0.4 ± 0.1	<0.3
7	<0.1	<0.1	<0.2	0.9 ± 0.5	0.3 ± 0.1	0.5 ± 0.3
8	<0.1	0.7 ± 0.1	<0.2	<0.7	0.2 ± 0.1	0.6 ± 0.1
9	<0.1	<0.1	0.7 ± 0.2	2.3 ± 0.6	0.3 ± 0.1	0.8 ± 0.2
10	<0.1	<0.1	<0.2	0.5 ± 0.3	0.3 ± 0.1	0.7 ± 0.2
11	<0.1	<0.1	<0.2	0.7 ± 0.3	0.2 ± 0.1	0.6 ± 0.1

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[a] Refer to Figures 21 and 22.

[b] Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.

TABLE 10

RADIONUCLIDE CONCENTRATIONS IN SUBSURFACE SOIL
FROM AREA B3
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Depth	Radionuclide Concentration (pCi/g)					
		Co-60	Cs-137	U-235	U-238	Th-228	Th-232
15N, 40E	0- 15 cm	<0.1	0.1 ± 0.1[b]	<0.3	0.8 ± 1.1	0.6 ± 0.1	1.5 ± 0.3
15N, 40E	30- 45 cm	<0.1	<0.1	<0.3	0.9 ± 0.8	0.5 ± 0.1	1.5 ± 0.3
15N, 40E	60- 75 cm	<0.1	0.1 ± 0.1	<0.3	<0.8	0.4 ± 0.1	1.4 ± 0.3
15N, 40E	90-105 cm	<0.1	<0.1	<0.3	1.1 ± 0.5	0.5 ± 0.1	1.2 ± 0.3
40N, 115E	0- 15 cm	<0.1	<0.1	<0.3	0.5 ± 0.8	0.5 ± 0.1	1.8 ± 0.2
40N, 115E	30- 45 cm	<0.1	<0.1	<0.3	2.2 ± 1.1	0.6 ± 0.2	1.1 ± 0.2
40N, 115E	60- 75 cm	<0.1	<0.1	<0.3	<1.0	0.5 ± 0.1	1.3 ± 0.3
40N, 115E	90-105 cm	<0.1	<0.1	<0.2	1.2 ± 0.7	0.5 ± 0.1	1.3 ± 0.2
5N, 105E	0- 15 cm	<0.1	<0.1	<0.2	<0.7	0.3 ± 0.1	1.2 ± 0.2
5N, 105E	30- 45 cm	<0.1	0.2 ± 0.1	<0.3	4.1 ± 1.0	0.4 ± 0.1	1.0 ± 0.2
5N, 105E	60- 75 cm	<0.1	<0.1	0.2 ± 0.2	0.9 ± 0.6	0.6 ± 0.1	1.5 ± 0.3
5N, 105E	90-105 cm	<0.1	0.1 ± 0.1	<0.3	<0.9	0.6 ± 0.1	2.1 ± 0.3
19N, 68E	0- 15 cm	<0.1	0.2 ± 0.1	0.2 ± 0.3	1.5 ± 1.0	0.4 ± 0.1	1.1 ± 0.2
19N, 68E	30- 45 cm	<0.1	<0.1	<0.3	1.0 ± 0.7	0.7 ± 0.1	1.8 ± 0.3
18N, 60E	0- 15 cm	<0.1	0.1 ± 0.1	<0.3	3.1 ± 0.7	0.7 ± 0.1	1.8 ± 0.2
18N, 60E	30- 45 cm	<0.1	<0.1	<0.3	2.1 ± 0.7	0.5 ± 0.1	1.7 ± 0.2

TABLE 10 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SUBSURFACE SOIL
FROM AREA 93
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location	Depth	Radionuclide Concentration (pCi/g)					
		Co-60	Cs-137	U-235	U-238	Th-228	Th-232
18N, 60E	60- 75 cm	<0.1	<0.1	<0.3	0.8 ± 0.2	0.4 ± 0.1	<0.3
18N, 60E	90-105 cm	<0.1	<0.1	<0.3	<0.8	0.5 ± 0.1	1.3 ± 0.2

[a] Refer to Figure 24.

[b] Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.

TABLE 11

Sr-90 AND ISOTOPIC URANIUM CONCENTRATIONS IN SELECTED SOIL SAMPLES
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Depth	Radionuclide Concentration (pCi/g)			
		Sr-90	U-234	U-235	U-238
Area B1[a]					
TRIGA Canyon	Surface	<0.1	1.2 ± 0.2[c]	<0.1	1.2 ± 0.2
Hot Cell Canyon	Surface	<0.1	1.3 ± 0.2	<0.1	1.3 ± 0.2
Hot Cell Canyon	Surface	<0.2	1.3 ± 0.2	0.1 ± 0.1	1.4 ± 0.2
TFF Canyon (#8)	Surface	<0.1	0.4 ± 0.1	0.1 ± 0.1	0.3 ± 0.1
East End of Culvert (#6)	Surface	<0.1	0.7 ± 0.1	<0.1	0.7 ± 0.1
East End of Access Road (#7)	Surface	<0.1	0.9 ± 0.1	<0.1	0.8 ± 0.1
Area B3[b]					
5N, 20E	Surface	<0.1	1.1 ± 0.2	<0.1	0.6 ± 0.2
5N, 60E	Surface	<0.1	1.5 ± 0.1	<0.1	1.0 ± 0.1
5N, 100E	Surface	<0.1	0.8 ± 0.2	<0.1	0.7 ± 0.2
5N, 110E	Surface	<0.1	1.0 ± 0.2	<0.1	0.9 ± 0.2
15N, 30E	Surface	<0.1	2.5 ± 0.3	0.1 ± 0.1	1.7 ± 0.3
15N, 60E	Surface	<0.1	1.6 ± 0.3	0.1 ± 0.1	1.1 ± 0.3
15N, 90E	Surface	<0.1	2.5 ± 0.3	<0.1	1.8 ± 0.2
25N, 0E	Surface	<0.1	0.8 ± 0.2	<0.1	0.9 ± 0.2
25N, 100E	Surface	<0.1	2.9 ± 0.4	0.1 ± 0.1	2.2 ± 0.4
35N, 50E	Surface	<0.1	1.4 ± 0.3	<0.1	0.9 ± 0.3
45N, 0E	Surface	<0.1	[illegible].3 ± 0.3	0.1 ± 0.1	0.8 ± 0.2
North of Primary Digester (#4)	Surface	<0.2	5.[illegible] ± 0.4	0.2 ± 0.1	2.9 ± 0.3
At South Fence At Boundary (#8)	Surface	<0.1	1.4 ± 0.3	0.1 ± 0.1	1.4 ± 0.3
18N, 60E	0- 15 cm	<0.1	1.5 ± 0.2	0.1 ± 0.1	0.9 ± 0.1
18N, 60E	30- 45 cm	<0.1	1.9 ± 0.2	0.1 ± 0.1	1.3 ± 0.1
18N, 60E	60- 75 cm	<0.1	1.9 ± 0.4	0.1 ± 0.1	1.6 ± 0.4
18N, 60E	90-105 cm	<0.1	1.6 ± 0.2	0.1 ± 0.1	1.4 ± 0.2
35N, 30E	Surface	-	22.0 ± 0.8	1.8 ± 0.3	8.8 ± 0.5
35N, 60E	Surface	-	4.4 ± 0.4	0.1 ± 0.1	2.0 ± 0.3
45N, 120E	Surface	-	33.0 ± 0.9	1.6 ± 0.3	19.4 ± 0.7
Between the Pumphouse and Flocculation Tank (#9)	Surface	-	9.0 ± 0.6	0.5 ± 0.2	4.2 ± 0.4

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[a] Refer to Figure 23.

[b] Refer to Figures 21, 22, and 24.

[c] Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not propagated into these data.

TABLE 12

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
IN AREA B3 FACILITIES
PHASE IV DECOMMISSIONING
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Number of Measurements	TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
		Alpha Range	Beta-Gamma Range	Alpha Range	Beta Range
Flocculating Tanks					
Floors	6	<21-210	1100-1800	<3	<6
Lower Wall	6	<12-170	1100-2700	<3	<6-7
Trickle Filter Tank					
Floor	3	<21- 64	1500-1800	<3	<6
Lower Wall	1	<21	1300	<3	7
West Clarifying Tank					
Floor	3	<30- 85	670-1500	<3	<6
Lower Wall	2	<30	1100	<3	<6
East Clarifying Tank					
Floor	2	32- 42	1200-1700	<3	<6
Lower Wall	2	53-120	1500-2700	<3	<6
Pumphouse Basement					
Floor	2	<30- 32	1400	<3	<6
Lower Wall	2	<30	<410-900	<3	<6
Secondary (South) Digester					
Floor	3	<30	430- 930	<3	<6
Lower Walls	2	<30	1100-1200	<3	<6
Primary (North) Digester					
Floor	2	<30	630- 700	<3	<6
Lower Walls	2	32-140	<410	<3	<6
Pumphouse Foundation (Concrete Slab)	3	<30	800-1000	<3-5	<6-7

[a] Refer to Figure 5.

REFERENCES

1. "Confirmatory Survey of Phase I Decommissioning, Former Waste Processing Facility, GA Technologies, San Diego, California," Oak Ridge Associated Universities, July 1986.

2. "Confirmatory Survey of Phase II Decommissioning, Former Waste Processing Facility, GA Technologies, San Diego, California," Oak Ridge Associated Universities, March 1987.

3. "Confirmatory Survey of Phase III Decommissioning, GA Technologies, San Diego, California," Oak Ridge Associated Universities, February 1988.

4. Letter from K.E. Asmussen (GA Technologies, Inc.) to R.D. Thomas (U.S. Nuclear Regulatory Commission, Region V), Reference: "License SNM-696 Docket 70-734", May 10, 1988.

5. Letter from L. Quintana (GA Technologies, Inc.) to J.D. Berger (Oak Ridge Associated Universities), May 26, 1988.

6. Letter from K.E. Asmussen (GA Technologies, Inc.) to R.D. Thomas (U.S. Nuclear Regulatory Commission, Region V), Reference: "License SNM-696 Docket 70-734", June 2, 1988.

APPENDIX A

CONFIRMATORY SURVEY PLAN FOR PHASE IV DECOMMISSIONING, GA TECHNOLOGIES

APPENDIX A

CONFIRMATORY SURVEY PLAN
FOR
PHASE IV DECOMMISSIONING
GA TECHNOLOGIES
SAN DIEGO, CALIFORNIA

I. Site History and Description

In mid 1984, GA Technologies, Inc. (GA) of San Diego, California, initiated decommissioning activities for the purpose of releasing portions of their facilities from Nuclear Regulatory Commission (NRC) licensing restrictions. The decommissioning is being accomplished in separate phases. Verification of Phases I, II, and III have been completed. Phase IV properties include the abandoned sewage treatment facility known as 'Callon Ponds', (Area B3), 13 laboratories in Building 2, and Area B1, the canyon area to the west and below the TRIGA and Hot Cell facilities. The Callon Ponds consist of approximately 1.2 hectares enclosed by a security fence. Several remaining structures, used during operation, are the pumphouse, a trickle filter tank, a primary (north) and secondary (south) digester, flocculating tanks, two clarifying tanks, a large evaporation pond, and two smaller evaporation ponds. Building 2 is divided into three laboratory sections. The 13 rooms are located in the upper and lower levels of laboratory sections B and C. There is approximately 5700 ft^2 (53 m^2) of area in these 13 rooms. Area B1 is composed of approximately 6.1 hectares of steep canyons. There are no facilities or equipment located in this area. Potential radiological contaminants in the areas included in this survey have been identified as enriched uranium, thorium, and longer half-life fission and activation products.

Phase IV activities have been completed and reports were issued by GA Technologies on May 10, 1988 and June 2, 1988, indicating that post

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June 7, 1988

decontamination radiological conditions satisfy the NRC guidelines for decommissioning. Region V of the NRC has requested that the Oak Ridge Associated Universities (ORAU) Radiological Site Assessment Program perform a confirmatory radiological survey of Phase IV locations.

II. Purpose

The purpose of the confirmatory survey is to verify that remedial actions and associated documentation provide an accurate and complete description of the condition of the property and thereby, confirm that remedial actions have been effective in satisfying the NRC guidelines for release for unrestricted use.

III. Responsibility

Work described in this survey plan will be performed under the supervision of Mr. J.D. Berger, Manager and Mr. G.L. Murphy, Assistant Manager with Radiological Site Assessment Program of Oak Ridge Associated Universities, and in accordance with standard procedures set forth in "Survey Procedures Manual", "Laboratory Procedures Manual", and Quality Assurance Manual", developed specifically for that program.

IV. Procedures

A. ORAU will review background documentation, radiological characterization data, and post-remedial action data. Information will be evaluated to assure that areas identified as exceeding site guidelines have undergone remedial action and that residual contamination satisfies the established guidelines.

B. A survey team from ORAU will visit the GA site and perform visual inspections, independent measurements of alpha, beta-gamma, and gamma radiation, and soil sampling. Reference grid systems, established by GA Technologies will be utilized, where possible.

C. Independent measurements and sampling will be performed on portions of the area to be verified. Typically, the independent survey will cover only a portion of the total remediated area, depending upon such factors as use history, radiological history, and decontamination procedures. For larger areas independent surveys will typically cover from 10 to 50% of the remediated area; up to 100% of individual small remediated areas may be surveyed as part of the confirmatory process. During field activities, the scope of the survey may be increased or decreased, based on findings as the work progresses.

1. A walkover gamma surface scan will be performed over related remediated areas of the site, where access can be obtained, using portable gamma scintillation detectors and ratemeters with audible indicators. Traverses will be at 1-2 m intervals in the gridded areas and locations where elevated direct radiation levels are noted. Scans may be expanded to the remainder of the remediated area, if results of initial scans identify discrepancies or deficiencies in the decontamination action. Locations of elevated contact measurements will be documented for further evaluation.

2. Gamma exposure rate measurements will be made at the surface and 1 m above the surface at single locations near small remediated areas and at 10 m intervals throughout remediated areas selected for independent survey. Measurements will also be made at locations of elevated direct radiation, identified by walkover scans.

3. Soil samples will be collected at locations of direct measurement as indicated in IV.C.2. above. The samples will be collected

from the surface (0-15 cm) of the remediated area, except where direct measurements suggest possible residual, subsurface contamination. In these cases, portable augering equipment will be used to collect subsurface soil samples. Subsurface samples to 1-2 m deep will be obtained from 10-15 randomly selected locations within the gridded area and in locations identified by surface scans as potential areas of residual contamination. The exact number, location, and depth will be determined as the survey progresses.

4. Where contamination may exist on facility or equipment surfaces, the surfaces will be scanned for elevated gamma radiation levels and for alpha and beta-gamma contamination. Up to 100% of the areas selected for survey may be covered by the scans, depending upon the use and radiological history.

5. Alpha and beta-gamma contamination measurements will be performed on facility and equipment surfaces. For remediated areas smaller than 10 m^2, single-point measurements of total contamination will be performed; the number of such measurements will be based on the actual area of each remediated location. Sample locations will be referenced to prominent building features. For areas larger than $10m^2$, a 2 m x 2 m grid will be established on the floor, and in selected grid blocks direct measurements of alpha and beta-gamma contamination will be systematically performed at the center and at four points, midway between the center and the block corners. Upper walls and ceiling measurement locations will be referenced to the floor grid or to pertinent building features.

6. Smears for removable contamination will be performed on remediated structures and equipment, at the location of highest direct measurement in each grid block surveyed, and at all locations of single-point measurements.

7. Direct measurements and smears will be obtained on piping, cracks, beams, ledges, ducts, and other surfaces where material might settle or accumulate. The survey will also include the inside surfaces of any drains. The number of locations measured will be determined as the survey progresses. Needs for additional measurements and sampling beyond the scope described in this plan will be determined based on specific site conditions and results.

8. Samples of building material; residue from cracks, ledges, piping, ducts, drains, and subfloor soil will be collected. The number and location will be determined based on the availability of sample media and direct measurements.

9. Residual contamination, identified by direct measurements, will be brought to the immediate attention of the licensee. If additional cleanup is performed during the survey, ORAU will conduct follow-up sampling and measurements of the cleaned areas.

V. Data and Sample Analysis

Samples and direct measurement data will be returned to the Oak Ridge, TN laboratory for analysis and interpretation. Data developed by the independent verification surveys will be compared with the established guidelines (Attachment A) to assure that decontamination has been effective in meeting these guidelines. Soil, residue, tile, and other solid materials will be analyzed by solid state gamma spectrometry. Radionuclides of primary interest are U-238, U-235, Th-232, Th-228, Co-60, and Cs-137; however, spectra will be reviewed for other identifiable photopeaks. Selected and/or computed samples will be analyzed for Sr-90. A gross alpha-beta counter will used to determine gross activity on smears.

VI. Tentative Schedule

Site Survey	June 20 - July 1,1988
Sample Analysis	July 5 - August 1,1988
Draft Report	September 1988

ATTACHMENT A

Decommissioning Guidelines for the GA Technologies Waste Processing Facility

Target criteria for unrestricted release of the GA Technologies' Waste Processing Facility and surrounding areas are presented in the licensee's final report and are as follows:

External Radiation

The gamma exposure rate at 1 m above the ground surface shall not exceed 10 μR/h above background for an area of greater than 30 ft x 30 ft and shall not exceed 20 μR/h above background for any discrete area (i.e. less than 30 ft x 30 ft).

Inhalation and Ingestion

Concentrations of radionuclides in soil shall be such that inhalation and ingestion are not expected to result in annual dose equivalents exceeding 20 mrem to the lung or 50 mrem to the bone.

Limiting soil concentrations were derived to satisfy these external and internal target criteria. The concentration limits are presented in the following table.

Radionuclide	Concentration Limit Above Background (pCi/g)
Depleted Uranium	35
Enriched Uranium	30
Thorium (Natural)	10
Co-60	8
Cs-137	15
Sr-90	1.8×10^3

Where more than one radionuclide is present, the sum of the ratios of the individual radionuclide concentrations to their respective concentration limits shall not exceed 1.

APPENDIX B

MAJOR SAMPLING AND ANALYTICAL EQUIPMENT

APPENDIX B

MAJOR SAMPLING AND ANALYTICAL EQUIPMENT

The display or description of a specific product is not to be construed as an endorsement of that product or its manufacturer by the authors or their employer.

A. Direct Radiation Measurements

Eberline "RASCAL"
Portable Ratemeter-Scaler
Model PRS-1
(Eberline, Santa Fe, NM)

Eberline PRM-6
Portable Ratemeter
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum, Sweetwater, TX)

Eberline Alpha Scintillation Probe
Model AC-3-7
(Eberline, Santa Fe, NM)

Eberline GM Pancake Probe
Model HP-260
(Eberline, Santa Fe, NM)

Victoreen Beta-Gamma "Pancake" Detector
Model 489-110
(Victoreen, Cleveland, OH)

Victoreen NaI Scintillation Detector
Model 489-55
(Victoreen, Cleveland, OH)

B. Laboratory Analyses

Automatic low-background Alpha-Beta Counter
Model LB5110-2080
(Tennelec, Inc., Oak Ridge, TN)

High-Purity Germanium Detector
Model GMX-23195-S, 23% efficiency
(EG&G ORTEC, Oak Ridge, TN)

Used in conjunction with:
Lead Shield, G-16
(Gamma Products, Inc., Palos Hills, IL)

High Purity Germanium Coaxial Well Detector
Model GWL-1102010-PWS-S, 23% efficiency
(EG&G ORTEC, Oak Ridge, TN)

Used in conjunction with:
Lead Shield Model G-16
(Applied Physical Technology, Atlanta, GA)

High Purity Germanium Detector
Model IGC25, 25% efficiency
(Princeton Gamma-Tech, Princeton, NJ)

Used in conjunction with:
Lead Shield
(Nuclear Data, Schaumburg, IL)

Multichannel Analyzer
ND-66/ND-680 System
(Nuclear Data Inc., Schaumburg, IL)

Alpha Spectrometry System
Tennelec Electronics
(Tennelec, Oak Ridge, TN)

Surface Barrier Detectors
(EG&G ORTEC, Oak Ridge, TN)

Multichannel Analyzer
Model ND-66
(Nuclear Data, Schaumburg, IL)

APPENDIX C

MEASUREMENT AND ANALYTICAL PROCEDURES

APPENDIX C

Measurement and Analytical Procedures

Surface Scans

Surface scans in the facility were performed by passing the probes slowly over the surface. The distance between the probes and the surface was maintained at a minimum - nominally about 1 cm. Identification of elevated levels was based on increases in the audible signal from the recording or indicating instrument. Alpha and beta-gamma scans of large surface areas on the floor of the facility were accomplished by use of a gas proportional floor monitor, with a 600 cm^2 sensitive area. The instrument was slowly moved in a systematic pattern to cover 100% of the accessible area. Combinations of detectors and instrument for the scans were:

Beta-Gamma - Pancake G-M probe with PRM-6 ratemeter.
Beta-Gamma - Pancake G-M probe with PRS-1 scaler/ratemeter.
Gamma - NaI scintillation detector (3.2 cm x 3.8 cm crystal) with PRM-6 ratemeter.
Alpha - ZnS probe with PRS-1 scaler/ratemeter.
Alpha-Beta - Gas proportional floor monitor with Ludlum Model 22[illegible] scaler/ratemeter.

Alpha and Beta-gamma Surface Contamination Measurements

Measurements of total alpha radiation level were performed using Eberline Model PRS-1 portable scaler/ratemeters with Model AC-3-7 alpha scintillation probes. Measurements of total beta-gamma radiation levels were performed using Eberline Model PRS-1 portable scaler/ratemeters with Model HP-260 thin-window "pancake" G-M probes. Count rates (cpm) were converted to disintegration rates (dpm/100 cm^2) by dividing the net rate by the 4π efficiency and correcting of the active area of the detector. Effective window areas were 59 cm^2 for the ZnS detectors and 15 cm^2 for the G-M detectors. The background count rate for ZnS alpha probes averaged approximately 2 cpm; the average background count rate was approximately 40 cpm for the G-M detectors.

Removable Contamination Measurements

Smear measurements were performed on numbered filter paper disks, 47 mm in diameter. Smears were placed in labeled envelopes with the locations and other pertinent information recorded. A ZnS alpha scintillation counting system was used to evaluate individual smears at the site; smears were recounted on a low background proportional counter at the Oak Ridge laboratory.

Exposure Rate Measurements

Measurements of gamma exposure rates were performed using Eberline PRM-6 portable ratemeters with a Victoreen Model 489-55 gamma scintillation probe containing 3.2 cm x 3.8 cm NaI(Tl) scintillation crystal. Count rates were converted to exposure rates (μR/h) by cross-calibrating with a Reuter Stokes model RSS-111 pressurized ionization chamber.

Soil Sample Analysis

Soil samples were dried, mixed, and a portion sealed in 0.5-liter Marinelli beaker. The quantity placed in the beaker was chosen to reproduce the calibrated counting geometry and typically ranged from 600 to 800 g of soil. Net soil weights were determined and the samples counted using intrinsic germanium detectors coupled to a Nuclear Data Model ND-680 pulse height analyzer system. Background and Compton stripping, peak search, peak identification, and concentration calculations were performed using the computer capabilities inherent in the analyzer system. Energy peaks used for determination of radionuclides of concern were:

Co-60	1.173 MeV
Cs-137	0.662 MeV
U-235	0.144 MeV
U-238	0.094 MeV from Th-234 (secular equilibrium assumed)
Th-228	0.583 MeV form Tl-208 (secular equilibrium assumed)
Th-232	0.911 MeV from Ac-228 (secular equilibrium assumed)

Spectra were also reviewed for the presence of other radionuclides.

Strontium-90 Analysis

Aliquots of soil were dissolved by pyrosulfate fusion and the strontium precipitated as a sulfate. Successive treatments with EDTA preferentially removed lead and excess calcium and returned the strontium to solution. Ferric and other insoluble hydroxides was precipitated at a pH of 12 to 14. Strontium was reprecipitated as a sulfate. Barium was removed as a chromate using DTPA. The final precipitate of strontium carbonate was counted using a low-background Tennelec alpha-beta proportional counter.

Alpha Spectrometry of Isotopic Uranium

Aliquots of soil were acidified and evaporated to dryness. The residues were then dissolved by pyrosulfate fusion and precipitated with barium sulfate. The barium sulfate precipitates were reclassified and uranium separated by liquid - liquid extraction. Uranium was then precipitated with a cerium fluoride carrier and counted using surface barrier detectors (ORTEC), alpha spectrometers (Tennelec), and an ND-66 Multichannel Analyzer (Nuclear Data).

Uncertainties and Detection Limits

The uncertainties associated with the analytical data presented in the tables of this report, represent the 95% confidence levels for that data. These uncertainties were calculated based on both the gross sample count levels and the associated background count levels. When the net sample count was less than the 95% statistical deviation of the background count, the sample concentration was reported as less than the detection limits of the procedure. Because of variations in background levels, sample weights or volumes, and Compton contributions from other radionuclides in samples, the detection limits differ from sample to sample and instrument to instrument. Additional uncertainties of ± 6 to 10%, associated with sampling and laboratory procedures, have not been propagated into the data presented in this report.

Calibration and Quality Assurance

Laboratory and field survey procedures are documented in manuals developed specifically for the Oak Ridge Associated Universities' Radiological Site Assessment Program.

With the exception of the measurements conducted with portable gamma scintillation survey meters, instruments were calibrated with NBS-traceable standards. The calibration procedures for the portable gamma instruments are performed by comparison with an NBS calibrated pressurized ionization chamber.

Quality control procedures on all instruments included daily background and check-source measurements to confirm equipment operation within acceptable statistical fluctuations. The ORAU laboratory participates in the EPA and DOE/EML Quality Assurance Programs.

APPENDIX D

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BY-PRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIAL

APPENDIX D

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE, OR SPECIAL NUCLEAR MATERIAL

U.S. Nuclear Regulatory Commission
Divison of Fuel Cycle & Material Safety
Washington, D.C. 20555

July 1982

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces or premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer of premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

   a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

   b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of

the survey report shall be filed with the Division of Fuel Cycle and Material Safety, USNRC, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

a. Identify the premises.

b. Show that reasonable effort has been made to eliminate residual contamination.

c. Describe the scope of the survey and general procedures followed.

d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223 Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm βγ/100 cm^2	15,000 dpm βγ/100 cm^2	1000 dpm βγ/100 cm^2

---

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] the maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

APPENDIX E

DECOMMISSIONING GUIDELINES FOR THE GENERAL ATOMICS FACILITY

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DECOMMISSIONING GUIDELINES FOR THE GENERAL ATOMICS FACILITY

Target criteria for unrestricted release of the General Atomics Waste Processing Facility and surrounding areas are presented in the licensee's final report and are as follows:[1]

External Radiation

The gamma exposure rate at 1 m above the ground surface shall not exceed 10 μR/h above background for an area of greater than 30 ft (9.1 m) x 30 ft (9.1 m) and shall not exceed 20 μR/h above background for any discrete area [i.e. less than 30 ft (9.1 m) x 30 ft 9.1 m)].

Inhalation and Ingestion

Concentrations of radionuclides in soil shall be such that inhalation and ingestion are not expected to result in annual dose equivalents exceeding 20 mrem to the lung or 60 mrem to the bone.

Limiting soil concentrations were derived to satisfy these external and internal target criteria. The concentration limits are presented in the following Table.

Radionuclide	Concentration Limit Above Background (pCi/g)
Depleted Uranium	35
Enriched Uranium	30
Thorium (Natural)	10
Co-60	8
Cs-137	15
Sr-90	1.8×10^3

Where more than one radionuclide is present, the sum of the ratios of the individual radionuclide concentrations to their respective concentrations limits shall not exceed 1.

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Oak Ridge Associated
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Commission's
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Sponsored by
Division of
Industrial and Medical
Nuclear Safety

CONFIRMATORY SURVEY OF FACILITIES IN BUILDINGS 2 AND 9 GENERAL ATOMICS SAN DIEGO, CALIFORNIA

P. R. COTTEN

Environmental Survey and Site Assessment Program
Energy/Environment Systems Division

FINAL REPORT
JULY 1989

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OF FACILITIES IN
BUILDINGS 2 AND 9
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Region V Office

FINAL REPORT

JULY 1989

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CONFIRMATORY SURVEY
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INTRODUCTION AND SITE HISTORY

In mid 1984, General Atomics (GA) of San Diego, California, initiated decommissioning activities for the purpose of releasing portions of their facilities from Nuclear Regulatory Commission (NRC) licensing restrictions. Because of the numerous building and land areas being decommissioned and the varied nature of former operations in these facilities, the decommissioning is being conducted in phases. Phase I activities included the Solar Evaporation Pond area, the areas immediately surrounding the former Waste Processing Facility, the Incinerator Pad, a previous burial site for contaminated asphalt, the hillside and canyon below the waste handling facilities, and undeveloped land surrounding the waste processing facilities; Phase II areas were the former Waste Processing Facility and the Incinerator Pad; Phase III consisted of approximately 87 hectares of undeveloped land, surrounding the main General Atomics plant facilities, and the shipping and receiving area of Building 5; and Phase IV included three canyons behind the Hot Cell and TRIGA facilities, a former sewage treatment plant known as "Callan Ponds," and 12 laboratories in Building 2 of the L Building Complex. These Phase I, II, III, and IV areas were previously remediated and confirmatory surveys performed by ORAU. Results of those surveys are presented in separate reports.$^{(1-4)}$ The Building 2 laboratories and offices, included in Phase IV decommissioning were designated as "Group 1" and "Group 2" facilities. An additional 19 laboratories, 12 of which include mezzanine areas, and 10 separate mezzanines only in Building 2 have been decontaminated as part of the "Group 3" activities. These rooms and mezzanines occupy approximately 904 m^2; the primary radionuclides used in these areas were Cs-137, Co-60, Sr-90, thorium, and uranium (natural, depleted, and enriched).

An approximate 268 m^2 area of Building 9, E Building Complex, has been decontaminated as Stage 1 of the current GA decommissioning activities. This is part of the building area, known as the "Hot Suite," once associated with the TRIGA fuel fabrication facility; now housed at a different location. The primary contaminant in this facility was uranium with U-235 enrichments, varying from 3 to 10%.

At the request of the NRC, Region V Office, the Environmental Survey and Site Assessment Program of Oak Ridge Associated Universities conducted a radiological survey to confirm the status of these portions of Buildings 2 and 9, relative to the NRC guidelines for release to unrestricted use. This survey was performed March 14-23, 1989, in accordance with a survey plan submitted to the Region V Office of the NRC. Procedures and results of this survey are presented in this report.

SITE DESCRIPTION

The General Atomics facilities are located near the intersection of Interstate 5 and Genesee Road, approximately 20 km north of San Diego, CA (Figures 1 and 2). Buildings 2 and 9 are illustrated in Figures 3 and 4.

Building 2, a two-story, semicircle building, located in the center of the GA facility, consists of office and laboratory space divided into three sections (A, B, and C). Some laboratories have mezzanine areas which were also utilized as both office or additional laboratory space. The nineteen laboratories and 22 mezzanines, included in this survey are shown on Figures 5, 6, and 7.

Building 9, located to the west of Building 2, is also a large (5541 m^2) two-story structure. A large portion of the building has been leased out to several different companies; the former TRIGA Fuel Fabrication "Hot Suite" was located in an area of Building 9 which is now occupied by GA's telecommunications group. The entire "Hot Suite" area originally occupied 375 m^2 of area and contained 9 rooms and 2 hallways (Figure 8); only the Stage 1 portion of the area is included in this survey.

PROCEDURES

Objectives

The objectives of the survey were to confirm that the radiological condition of those areas of Buildings 2 and 9, included in this phase of decommissioning, is accurately presented in the General Atomics report and to provide information and data for evaluation of the site status, relative to NRC guidelines for release for unrestricted use.

Document Review

The licensee's survey reports for the unrestricted release of portions of Buildings 2 and 9 was reviewed by ORAU(5-7). Data presented in these reports were compared to the established release guidelines.

Facility Survey

The following "Group 3" laboratories and office areas were surveyed in Section A of Building 2: Rooms 647, 649, and 651 and the mezzanines of Rooms 615/617 and 645/647. In Section B, Room 234 was surveyed. Rooms 302, 309, (Rooms 1 and 2), 315, 321, 323, 327, 343, 345, 347, 425, 427, 429, 431, and 433 and mezzanines of Rooms 321/323, 325/327, 335/337, 339/341, 343/345, 347/349, 425/427/429, 431/433, 615/617, and 645/647 were surveyed in Section C of Building 2. In the "Hot Suite" of Building 9 Rooms 33, 34, 38, 39, the main entrance hallway, a portion of 46B, 47A, 48, 49A, 50, and the sidewalk area outside Room 48 were surveyed, Figures 9 through 42 show the layouts of these areas.

Gridding

An alphanumeric 2 m x 2 m reference grid system was established on the floor and lower walls (up to 2 m) for each room and mezzanine surveyed. Measurements made on upper walls, ceiling, or equipment were referenced to the established grid or prominent building features.

Surface Scans

Alpha, beta-gamma, and gamma scans were performed on floors and lower walls, using an alpha/beta gas proportional large area detector, beta-gamma GM detectors, and NaI(Tl) gamma scintillation detectors with audible indicating scaler/ratemeters. Scans of surface areas not accessible to the large area detector, i.e., ceilings, and overhead areas such as ledges, beams, piping, fixtures, counter tops, equipment, and ductwork were performed using portable ZnS alpha scintillation and GM detectors. Locations of elevated radiation levels were noted for additional measurements.

Surface scans using a NaI(Tl) scintillation detector, were performed in areas where the floor had been removed and the underlying soil was exposed. Additional measurements were made with a beta-gamma GM detector to define any areas where elevated locations were identified.

Exposure Rate Measurement

Gamma exposure rates were determined throughout the facilities, based on gamma scan data and cross-calibration with a pressurized ionization chamber.

Measurement of Surface Contamination Levels

In Building 2, surface contamination measurements were performed on a total of 78 randomly selected grid blocks on the floor and lower walls. In each grid surveyed, direct measurements of alpha and beta-gamma contamination levels were systematically performed at the center and four points midway between the center and block corners. Smears for removable alpha and beta contamination were performed at that location in each grid block where the highest direct level was obtained. Single point measurements for total and removable alpha and beta-gamma contamination levels were performed on upper walls, overhead surfaces (higher than 2 m) such as ledges, ceilings, beams, pipes, ductwork, and miscellaneous equipment. A total of 152 single measurements were collected. Direct measurements and smears were also collected from floor drains at several locations. Measurement locations in Building 2 are indicated on Figures 9 through 32.

Five point measurements were performed in 16 grid blocks in Building 9 and single point measurements were performed at 29 locations. Measurements were also performed on 2 floor drains. Figures 33 through 42 show the locations of the surface contamination measurements in this Building.

Soil Sampling

Soil samples were collected from excavated floor areas. In Building 2 ten samples were collected from the excavated trenches in Rooms 302, 309 (1 and 2), the adjoining hallway, and the outside area where the drainline had previously emptied into a waste tank (Figures 11 and 12). Samples (four) were also collected from open trenches in Rooms 49A and 50 (Figures 40 and 41).

Miscellaneous Samples

A large area swipe was used to collect a sample of residue from a floor drain in room 425. One paint sample was collected from a ledge in the mezzanine area of room 321 (Figure 14 and 24).

Background and Baseline Measurements

Background measurements and soil samples were collected to determine area background and to provide baseline radionuclide concentrations for comparison purposes. Locations of the background measurements and baseline samples are shown in Figure 43.

Sample Analyses and Interpretation of Results

Samples were returned to laboratories in Oak Ridge, Tennessee, for analyses. All soil samples were analyzed by gamma spectrometry. The major radionuclides of interest were Co-60, Cs-137, U-235, U-238, and Th-232; however, spectra were reviewed for the presence of other identifiable or significant photopeaks. Smears were counted for alpha and beta levels, using a low background gas proportional counter. Additional information concerning analytical equipment and procedures is presented in Appendices A and B. Survey results were compared to NRC guidelines for decommissioning of the General Atomics Facility (Appendix C).

RESULTS

Document Review

ORAU's review of the survey reports, submitted by GA to the NRC, indicates that the procedures and instrumentation used were consistent with current industry accepted practices. A review of the documentation indicated that GA was successful in identifying problem areas and decontaminating these areas to the guidelines established. Additional material was reviewed for 2 areas, where the survey was completed after the initial report was prepared. Several inconsistencies between the field survey data and the final documentation were noted; however, these inconsistencies were minor and did not involve situations of guidelines being exceeded. One area surveyed by ORAU had not yet been surveyed thoroughly by GA.

Background Levels and Baseline Concentrations

Background exposure rates and baseline radionuclide concentrations in soil from the vicinity of the General Atomics site are presented in Table 1 and Table 2. Exposure rates ranged from 7 to 13 μR/h, at one meter from the surface. Cobalt-60 concentrations were less than 0.1 pCi/g, Cs-137 ranged from <0.1 to 0.2 pCi/g, U-235 ranged from <0.2 to 0.7 pCi/g, U-238 ranged from 1.1 to 1.6 pCi/g, and total thorium concentrations ranged from 1.3 to 3.2 pCi/g. These levels are typical of exposure rates and radionuclide concentrations, normally occurring in the environment.

Building 2

Surface Scans

Surface scans identified several locations of residual beta-gamma contamination exceeding guidelines in four laboratory areas. These were in Rooms 1 and 2 of 309 (floor and lower wall), Room 315 (below tile floor and wall), and Room 321 (window ledge). Sampling paint from the mezzanine window ledge in 321, removed the contamination at this location. The other areas were brought to the attention of the licensee; additional cleanup was performed, resulting in reduction of the direct radiation to below guideline levels.

Exposure Rates

Exposure rates throughout all surveyed areas were in the range of natural background levels, i.e. less than 13 μR/h, at 1 m above the surface.

Surface Contamination Levels

Table 3 summarizes the results of surface contamination measurements in Building 2. These data represent the measurements performed after any additional cleanup of areas identified by the ORAU surface scans. In many instances, the levels were below the detection sensitivities of the procedure. For five-point grid block measurements the individual total alpha and beta-gamma levels ranged from <24 to 100 dpm/100 cm^2 from <320 to 5700 dpm/100 cm^2, respectively; the highest grid block averages were 43 dpm/100 cm^2 for alpha and 2700 dpm/100 cm^2 for beta-gamma. Removable alpha contamination levels ranged from <3 to 21 dpm/100 cm^2 and removable beta contamination ranged from <6 to 9 dpm/100 cm^2. Single-point measurements of total contamination ranged from <27 to 1500 dpm/100 cm^2, alpha, and from <320 to 9000 dpm/100 cm^2, beta-gamma. The highest alpha and beta-gamma measurements were on a step, leading to the mezzanine area of Rooms 431/433. Removable alpha contamination at these locations ranged from <3 to 9 dpm/100 cm^2 and removable beta contamination ranged from <6 to 64 dpm/100 cm^2.

Radionuclide Concentrations in Soil Samples

Concentrations of radionuclides in soil samples collected from excavated trench areas in Building 2 are presented in Table 5. Samples were collected from Room 302, the hallway, the outside sidewalk, and from Rooms 1 and 2 of 309. Co-60 concentrations ranged from <0.1 to 19.0 pCi/g. The removal of additional soil reduced Co-60 concentrations to 3 pCi/g. Cs-137 concentrations ranged from <0.1 to 7.0 pCi/g; U-235 levels ranged from <0.2 to <0.5 pCi/g; U-238 levels ranged from <0.6 to 2.0 pCi/g; and Th-232 concentrations ranged from <0.4 to 2.0 pCi/g.

Miscellaneous Samples

No detectable activity was present on the large area swipe taken from the drain in Room 425. The paint sample from the window ledge on the mezzanine of Room 321 was known to contain activity, based on the direct measurements, before and after the sample was collected. This sample was not analyzed, because it would not be representative of the final radiological conditions. Followup measurements at this sampling location indicated total and removable contamination levels were below detection limits.

Building 9

Surface Scans

Surface scans identified one location of elevated direct radiation; this was a small area above a doorway in Room 48. This location was brought to the attention of the licensee, and further cleanup reduced direct measurements to acceptable levels.

Exposure Rates

At 1 m above the surface exposure rates throughout the facility were in the range of natural background levels of approximately 10 to 13 μR/h.

Surface Contamination Levels

Results of surface contamination measurements in Building 9 are summarized in Table 4. For five-point grid block surveys total individual contamination measurements ranged from <24 to 1300 dpm/100 cm^2 for alpha and from <360 to 6400 dpm/100 cm^2 for beta-gamma. Highest grid block averages were 470 dpm/100 cm^2, alpha, and 1900 dpm/100 cm^2, beta-gamma; these maximum levels occurred on the floor of Room 49A. Removable contamination from grid block surveys was, for the most part, less than the detector sensitivity, with alpha measurements ranging from <3 to 19 dpm/11 cm^2 and beta measurements ranging from <6 to 14 dpm/100 cm^2. For single-point measurements the levels for total contamination for alpha and beta-gamma ranged from <24 to 240 dpm/100 cm^2, and

<320 to 9300 dpm/100 cm^2, respectively. The highest levels were from the location above the doorway in Room 48, which was identified by scans and further remediated by the licensee. Removable contamination levels were low; alpha ranged form <3 to 36 dpm/100 cm^2 and beta ranged from <6 to 35 dpm/100 cm^2.

Radionuclide Concentrations in Soil Samples

Table 5 lists the concentrations of radionuclides present in soil samples from Rooms 49A and 50. Cobalt-60, and Cs-137 concentrations were <0.1 pCi/g; U-235 levels ranged from <0.2 to <0.3 pCi/g; U-238 concentrations ranged from <0.6 to 3.0 pCi/g; and Th-232 concentrations were from 1.0 to 2.0 pCi/g.

COMPARISON OF SURVEY RESULTS WITH GUIDELINES

The guidelines for decommissioning the General Atomics facility are presented in Appendix C. Surface contamination limits for building surfaces are based on primary contaminants of uranium, Cs-137, and Co-60, identified on this site, and are:

Alpha

5000 dpm/100 cm^2, averaged over 1 m^2
15000 dpm/100 cm^2, maximum in 100 cm^2
1000 dpm/100 cm^2, removable

Beta-Gamma

5000 dpm/100 cm^2, averaged over 1 m^2
15000 dpm/100 cm^2, maximum in 100 cm^2
1000 dpm/100 cm^2, removable

The survey performed by ORAU detected several isolated locations of residual contamination on surface areas. Additional clean-up was performed by the licensee, resulting in reduction or removal of the contaminant. In Buildings 2 and 9 all grid blocks satisfied the 5000 dpm/100 cm^2 average level. There were several individual measurements between 5000 and 15000 dpm/100 cm^2; however, each of these measurements represented small, isolated spots of contamination and averaging with contiguous surfaces resulted in satisfying the 5000 dpm/100 cm^2 average guideline. No measurements were in excess of the

15000 dpm/100 cm^2 guideline level. Removable contamination levels were also well within the guideline value of 100 dpm/100 cm^2.

Exposure rates throughout the buildings were in the range of background levels and therefore well within the guideline of 10 μR/h above background.

Concentrations of radionuclides in soil samples from excavated floor areas were all well within the guideline values established specifically for the GA site decommissioning.

SUMMARY

At the request of the NRC Region V Office, during March 1989, Oak Ridge Associated Universities performed a confirmatory survey of portions of Buildings 2 and 9, being decommissioned by General Atomics in San Diego, California. The survey included alpha, beta-gamma, and gamma scans and measurements of total and removable surface contamination, exposure rates, and radionuclide concentrations in soil. The initial scans identified several small areas of residual contamination; these were immediately cleaned by the licensee and resurveyed by ORAU. Final measurements indicated that all radiological conditions satisfied the established decommissioning guidelines. Based on the findings of this survey, it is ORAU's opinion that the office and laboratory areas of Building 2 and Building 9, included in this decommissioning effort, now meet the guidelines for release from radiological restrictions.

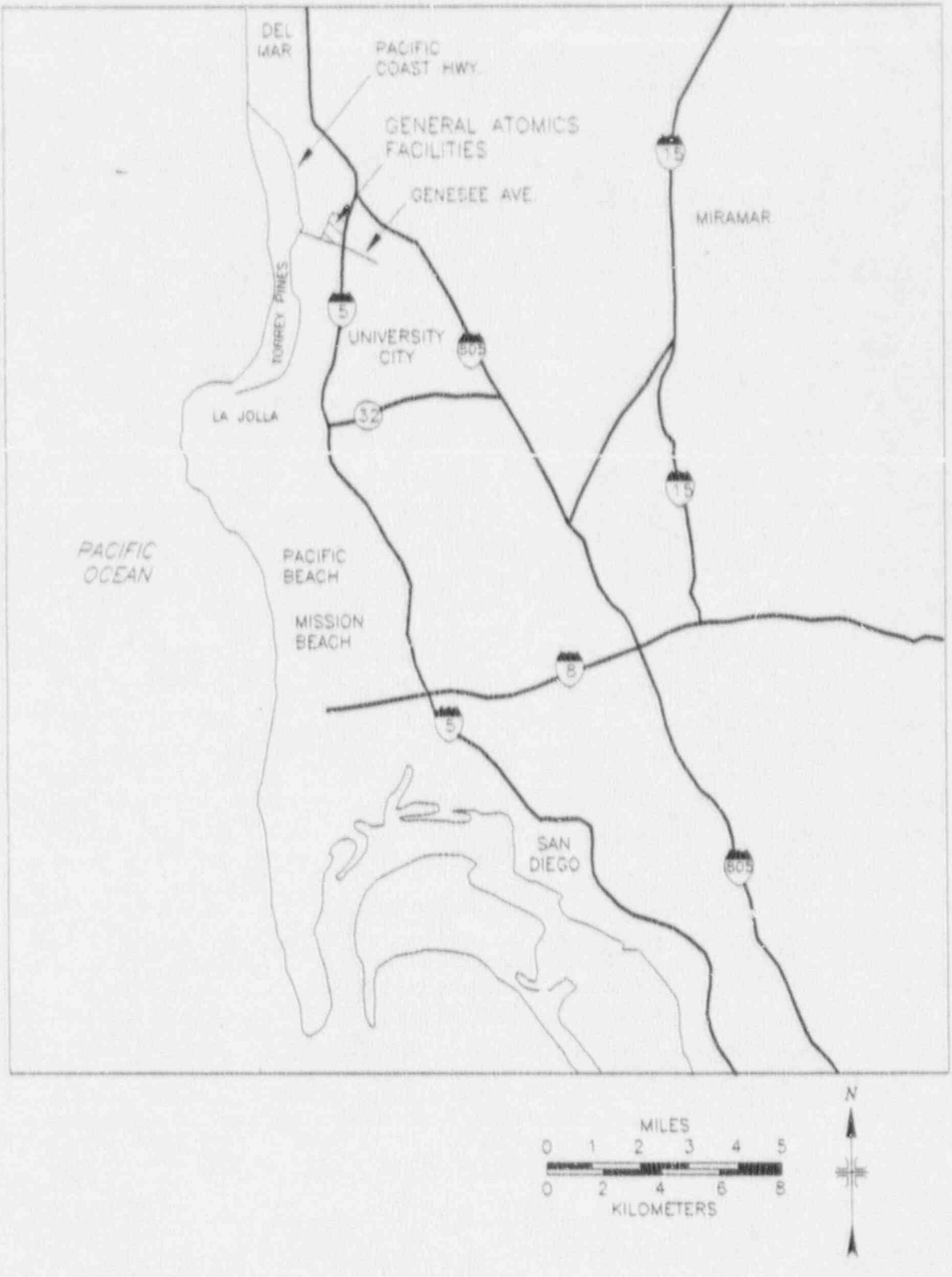

FIGURE 1: Map of the San Diego Area, Indicating the Location of General Atomics Facilities

GAT7

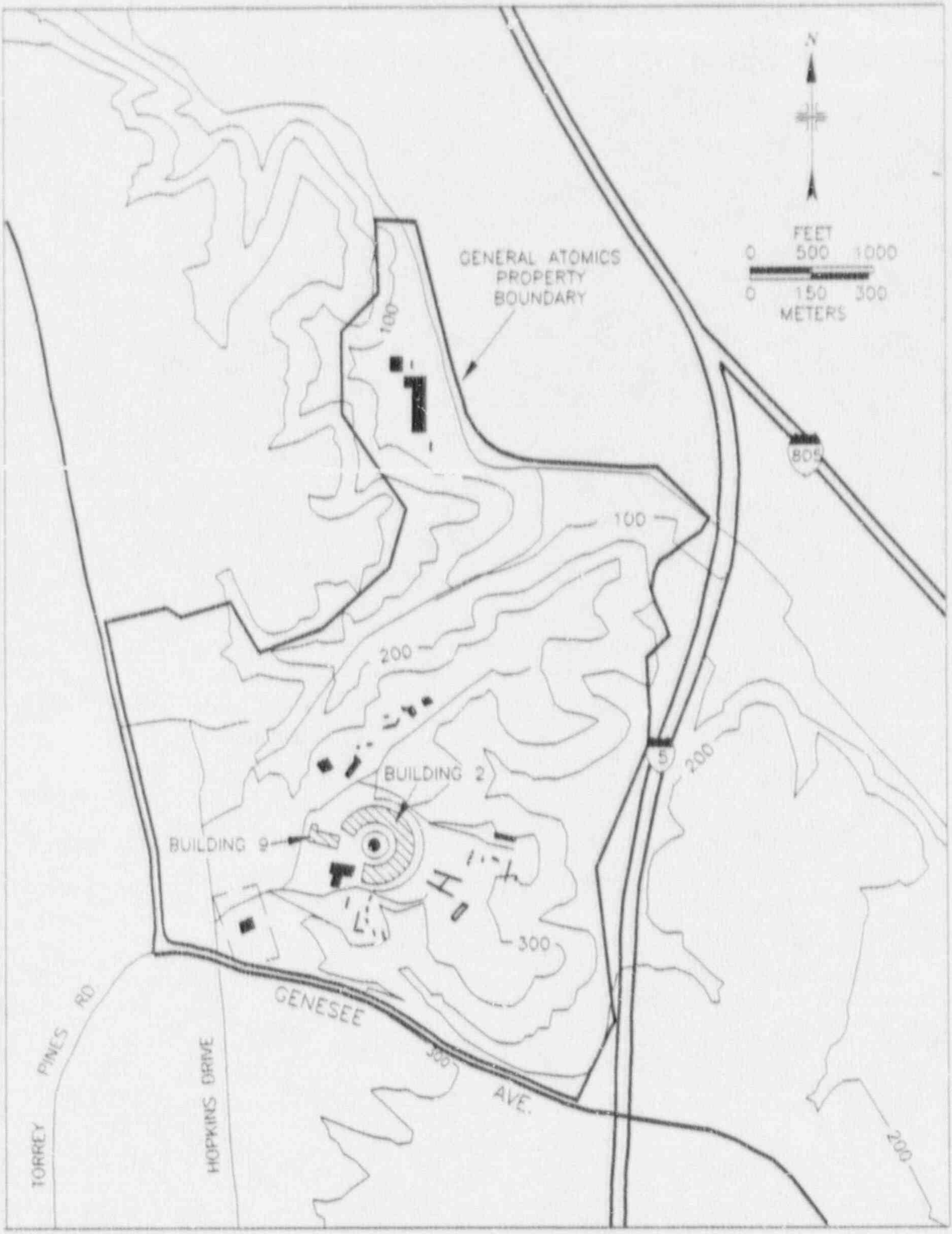

FIGURE 2: General Atomics Plant Layout

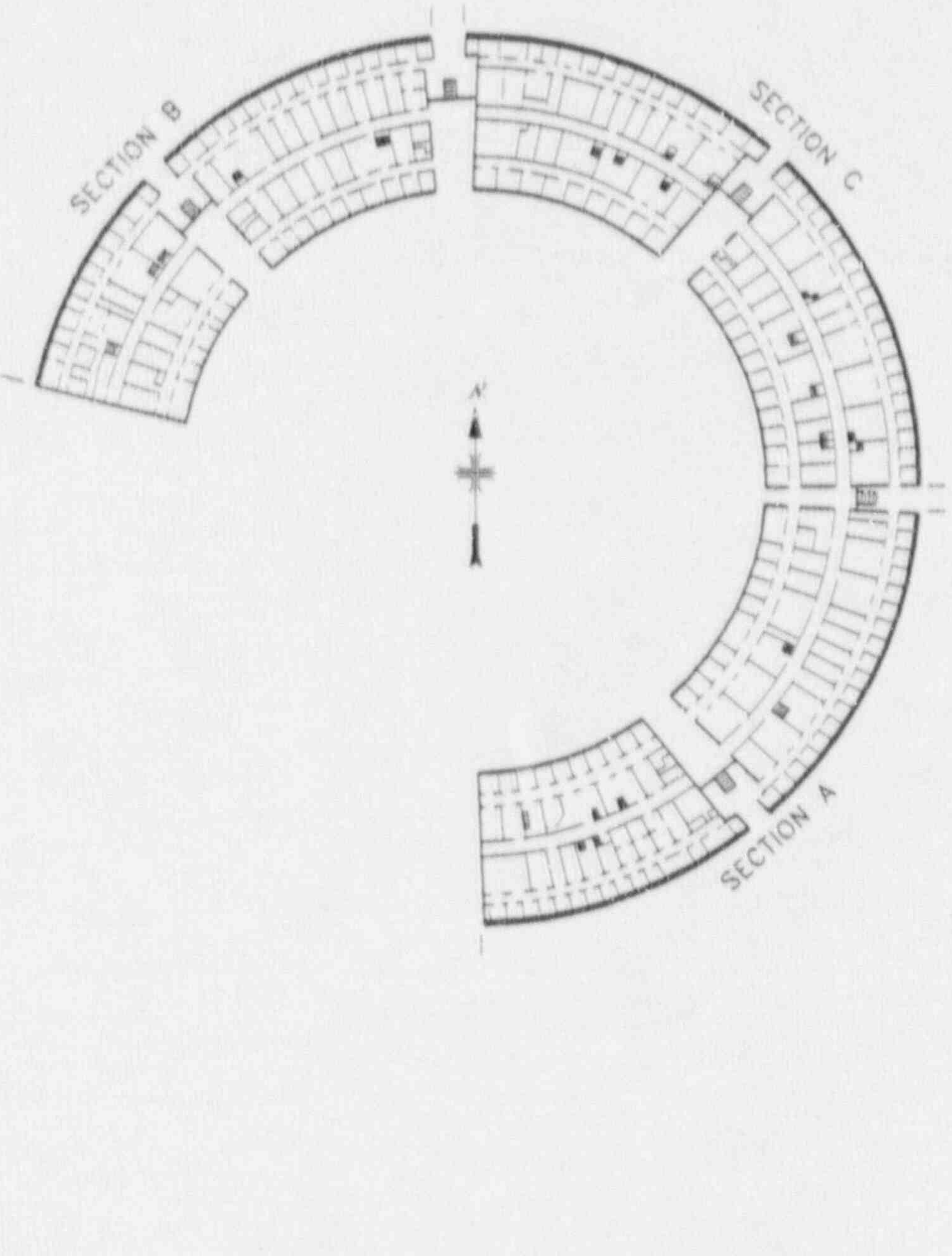

FIGURE 3: Layout of Building 2 (L Building Complex)

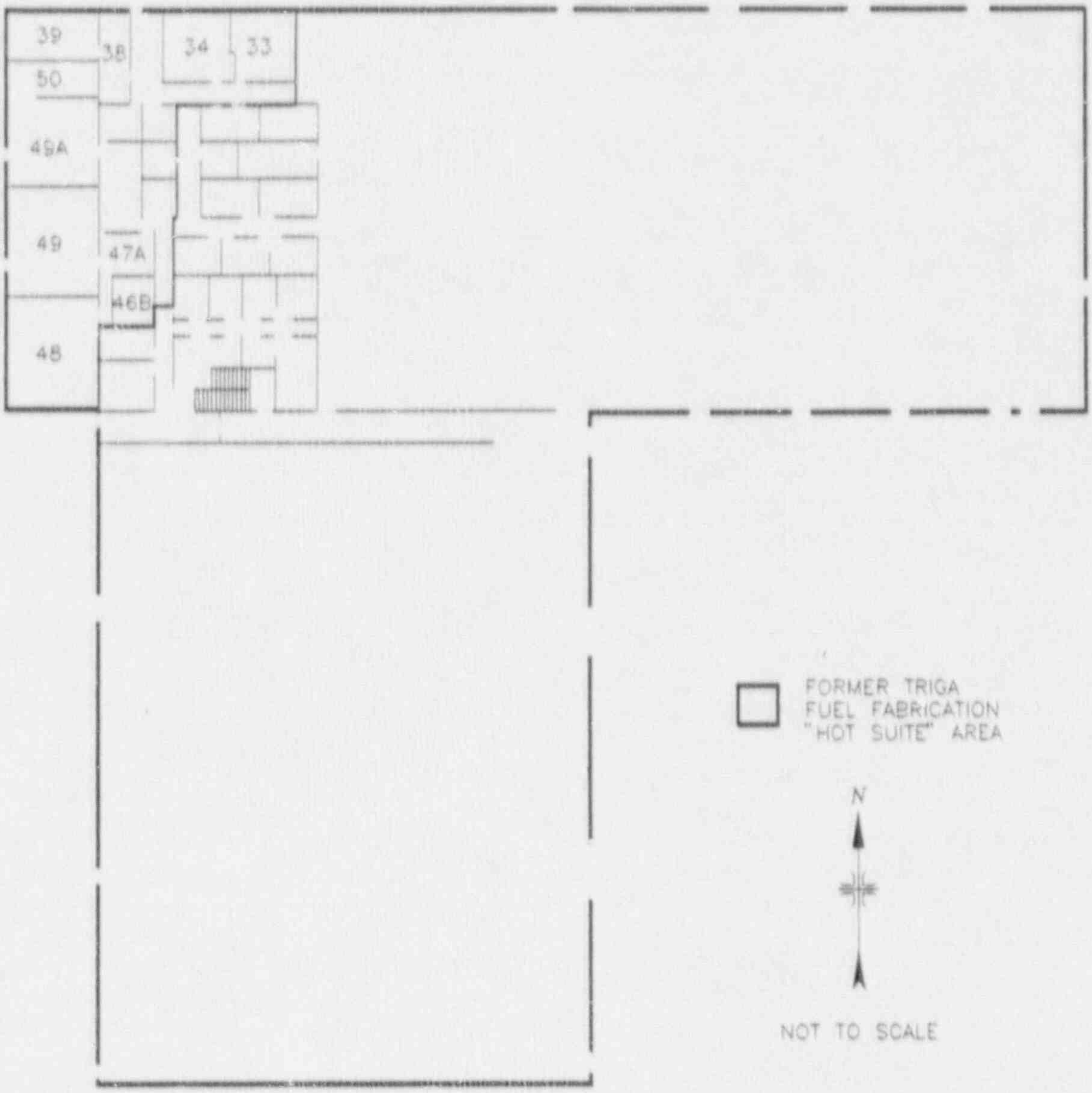

FIGURE 4: First Floor of Building 9 Indicating the Former Location of the TRIGA Fuel Fabrication "Hot Suite" Area

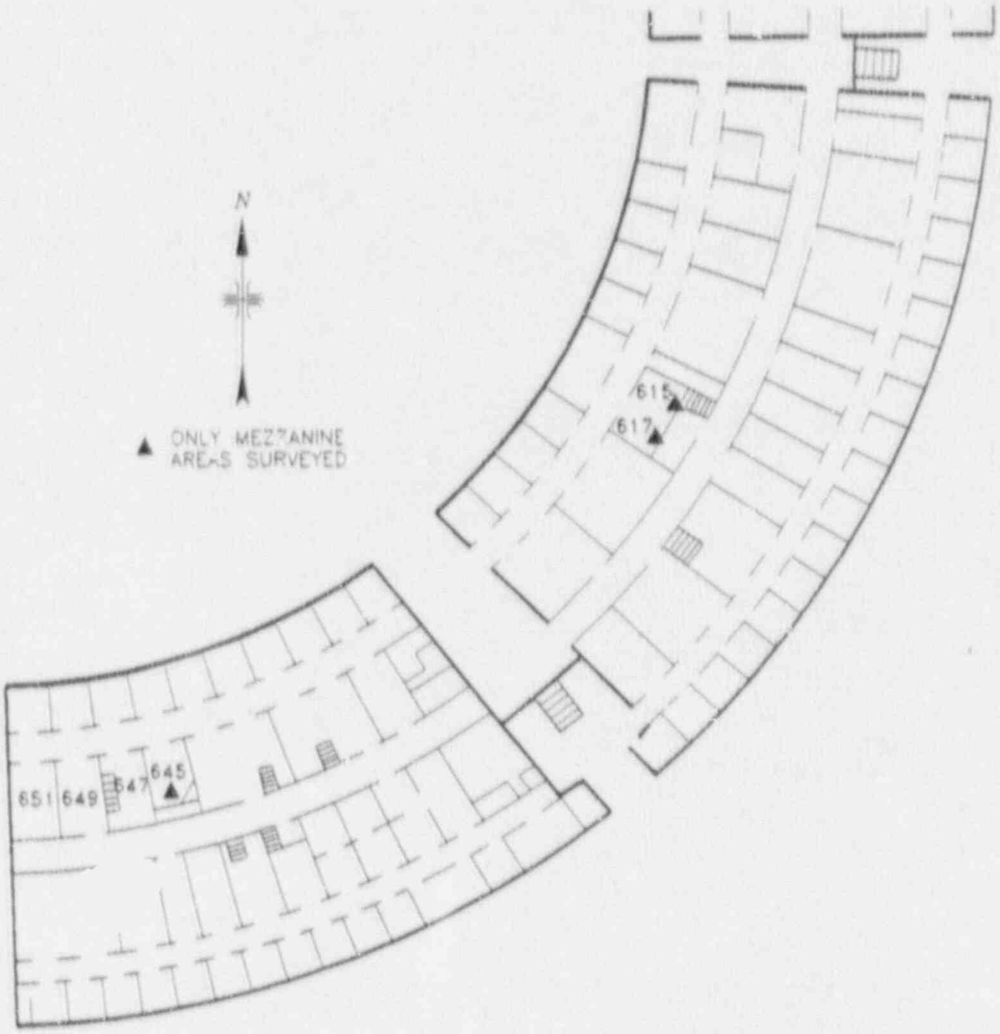

FIGURE 5: Section A of Building 2, Indicating Rooms Included in Group 3 Decommissioning

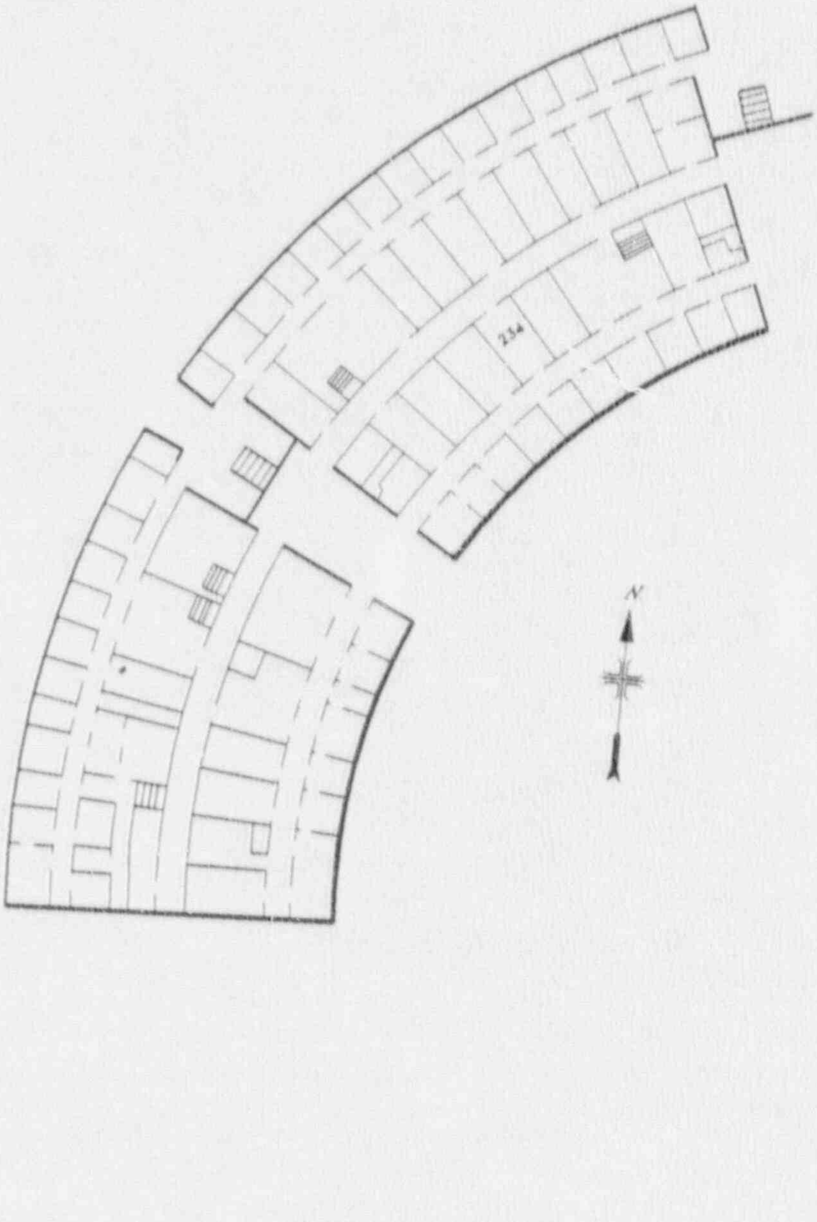

FIGURE 6: Section B of Building 2, Indicating Rooms Included in Group 3 Decommissioning

OAT27

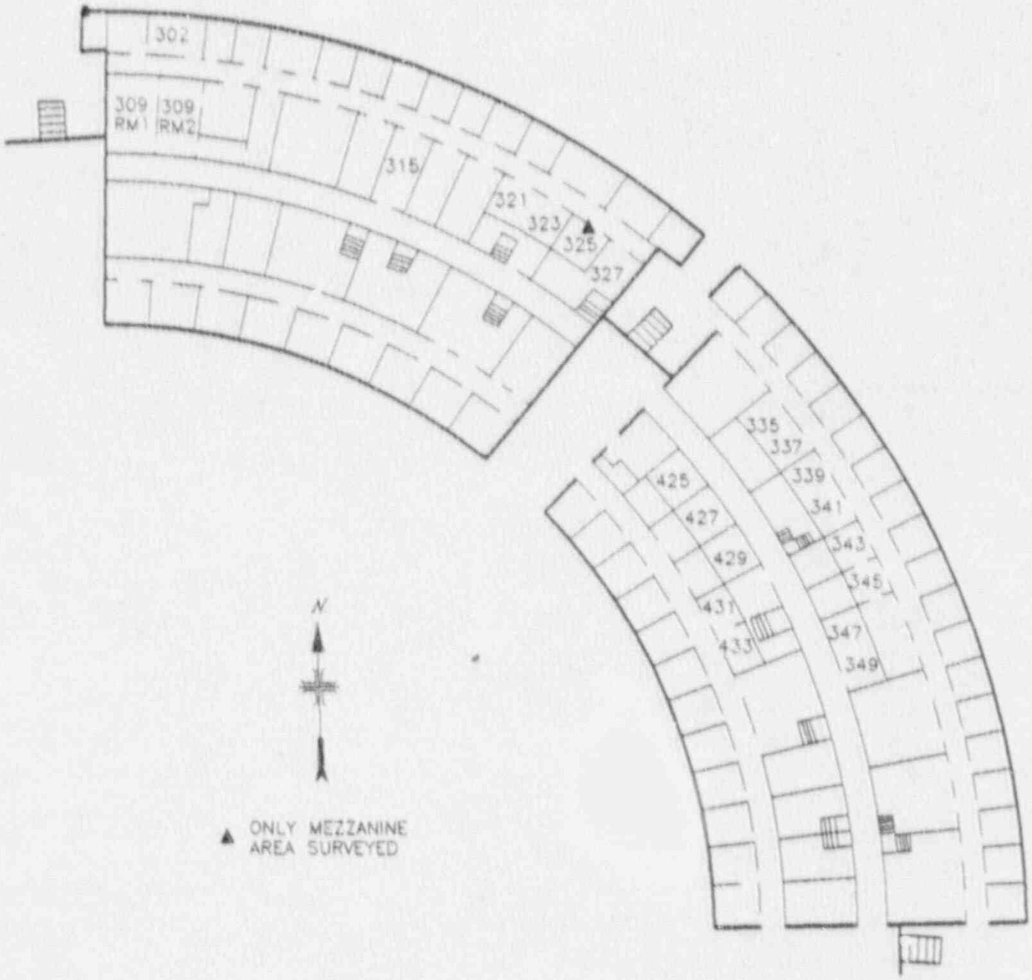

FIGURE 7: Section C of Building 2, Indicating Rooms Included in Group 3 Decommissioning

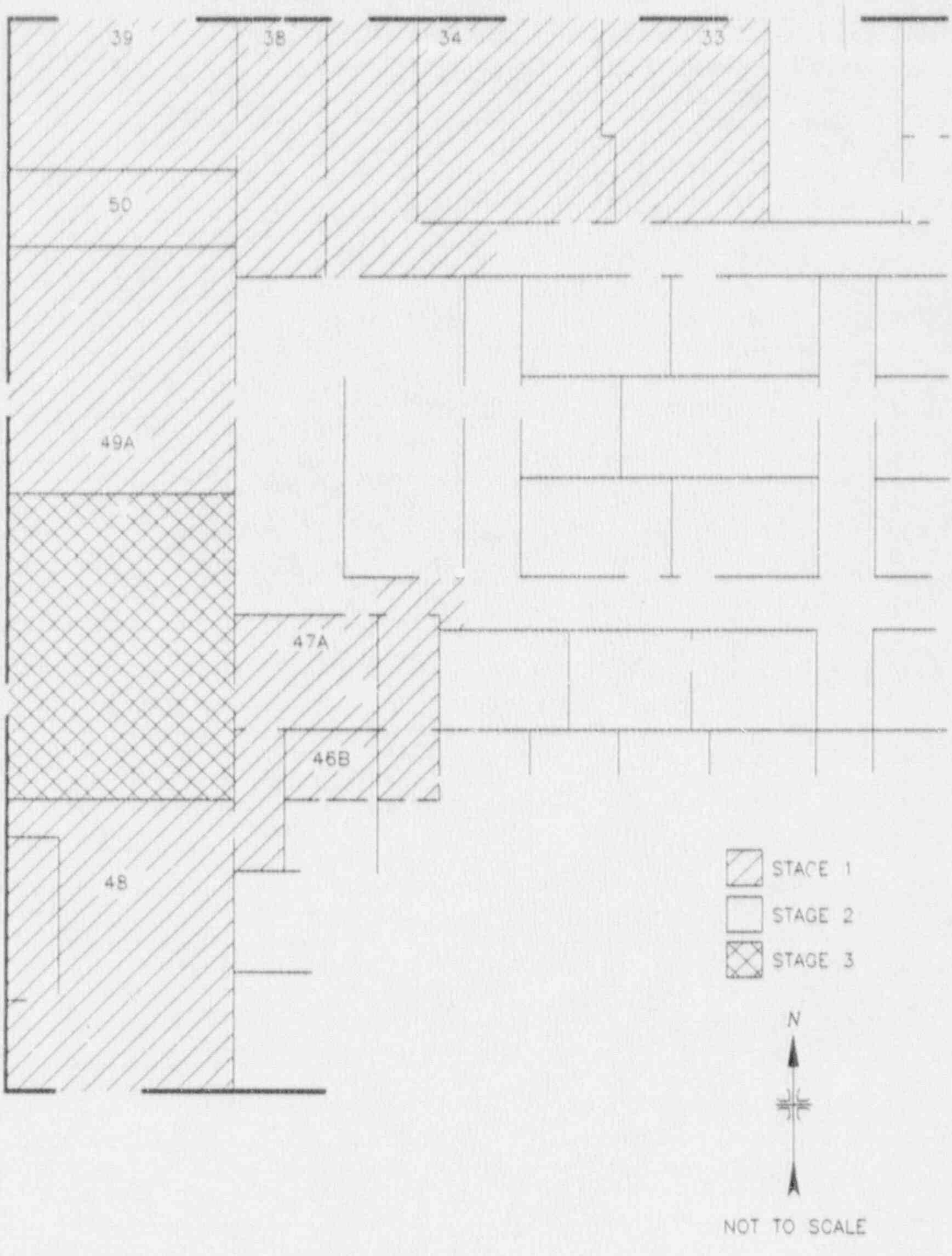

FIGURE 8: Decontamination Stages for the "Hot Suite" Area Building 9

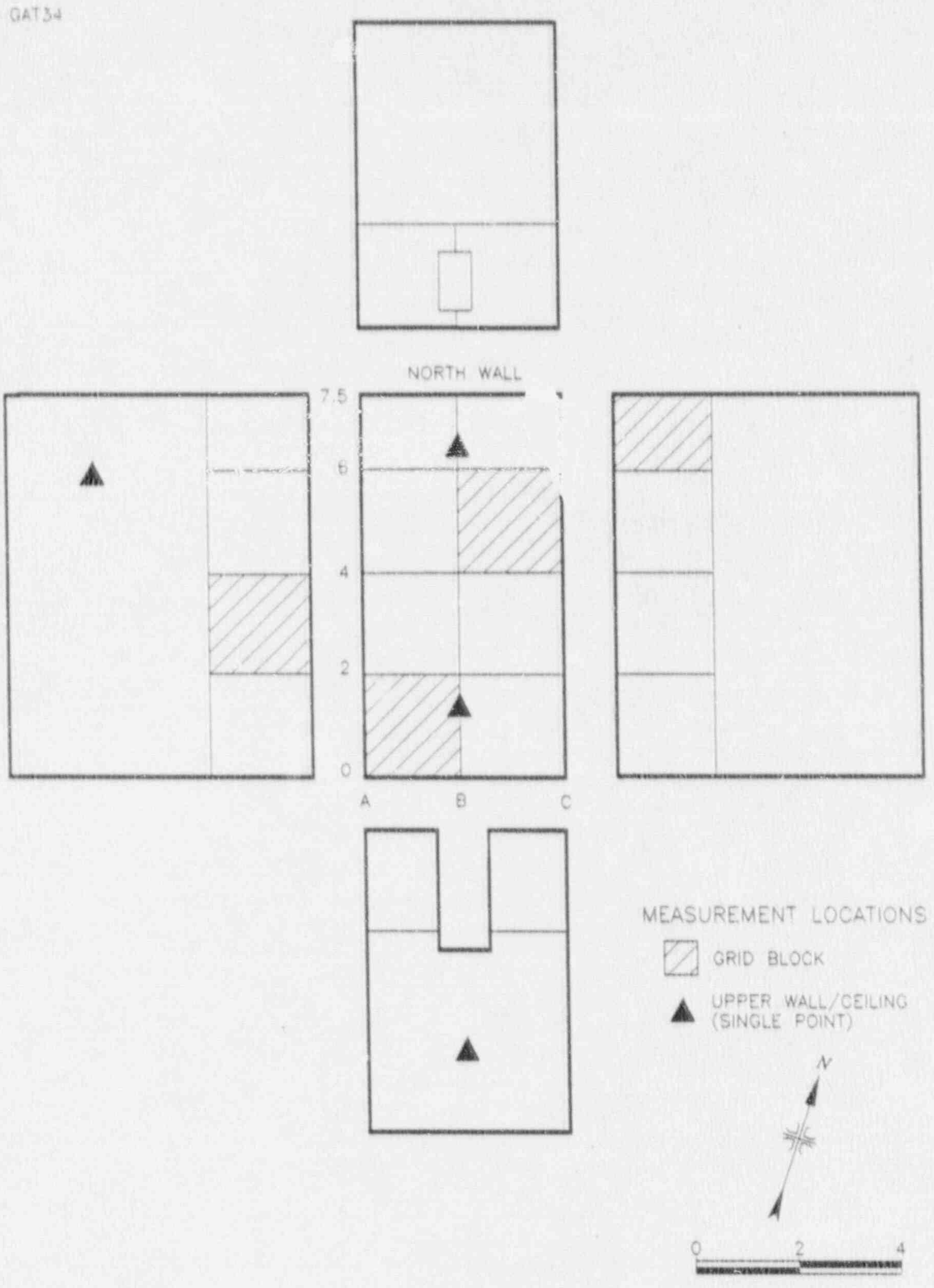

FIGURE 9: Layout of Room 234, Indicating Locations of Surface Contamination Measurements

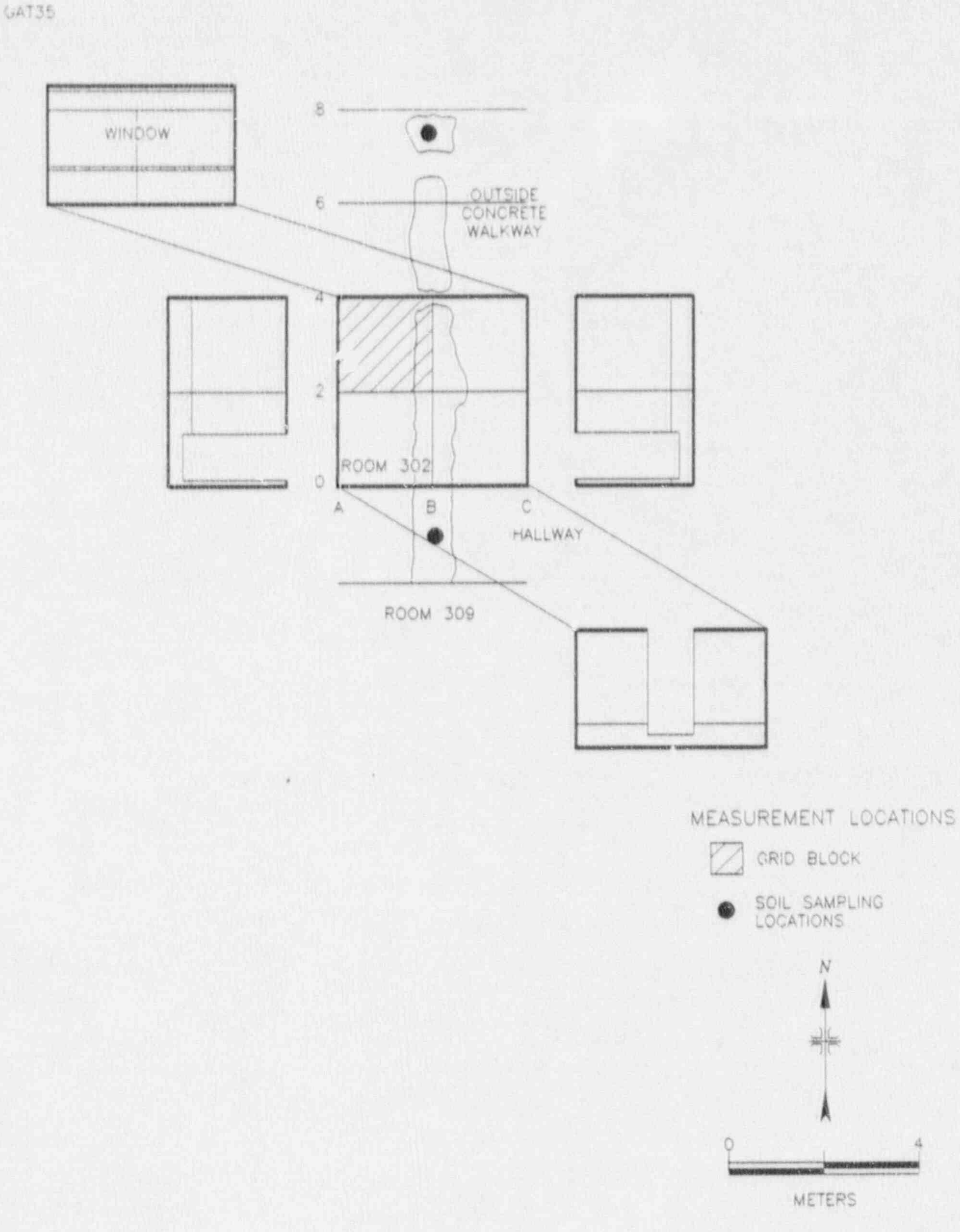

FIGURE 10: Layout of Room 302 with Aajoining Walkways, Indicating Locations of Sampling and Surface Contamination Measurements

GAT36

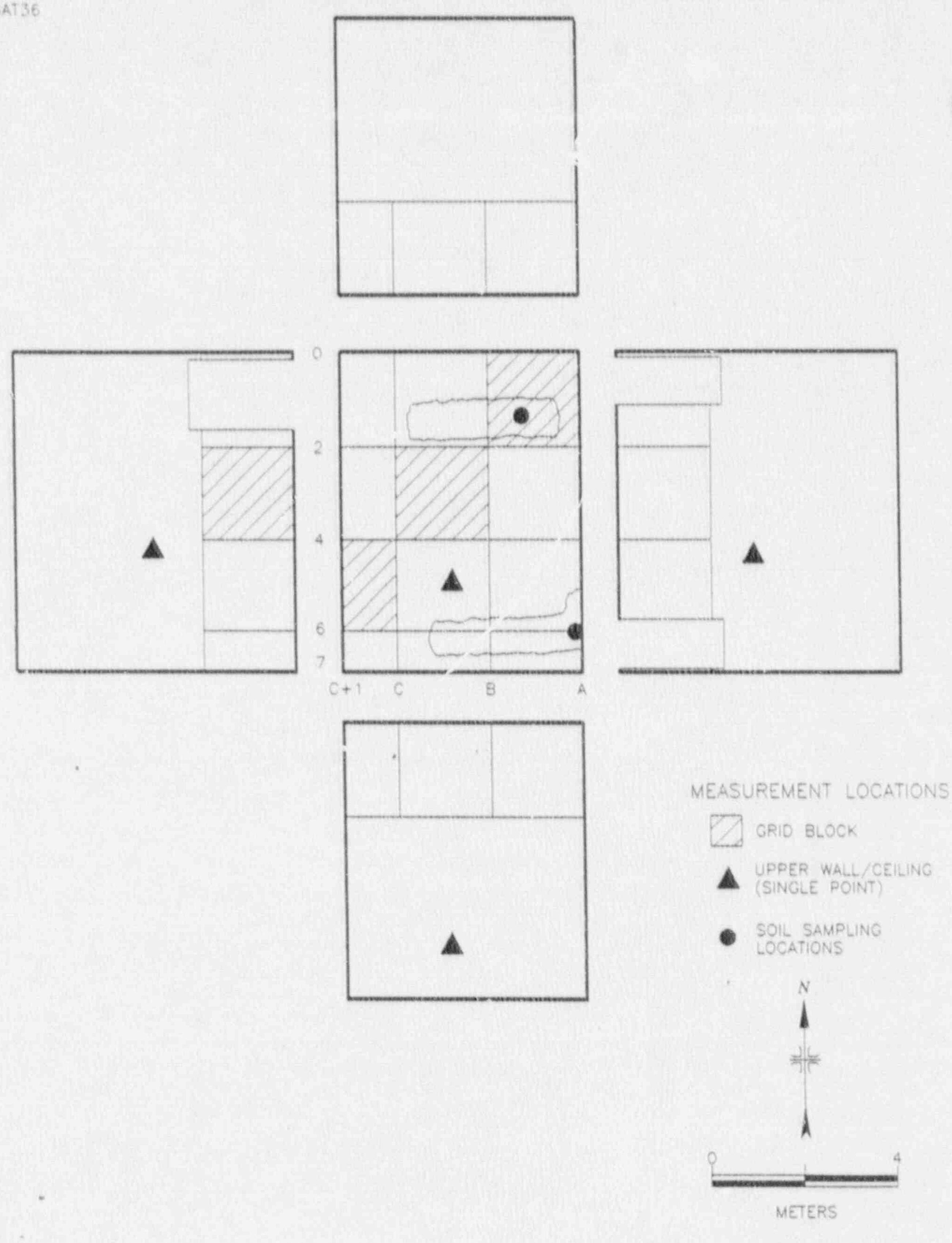

FIGURE 11: Layout of 309, Room 1, Indicating Locations of Sampling and Surface Contamination Measurements

GAT37

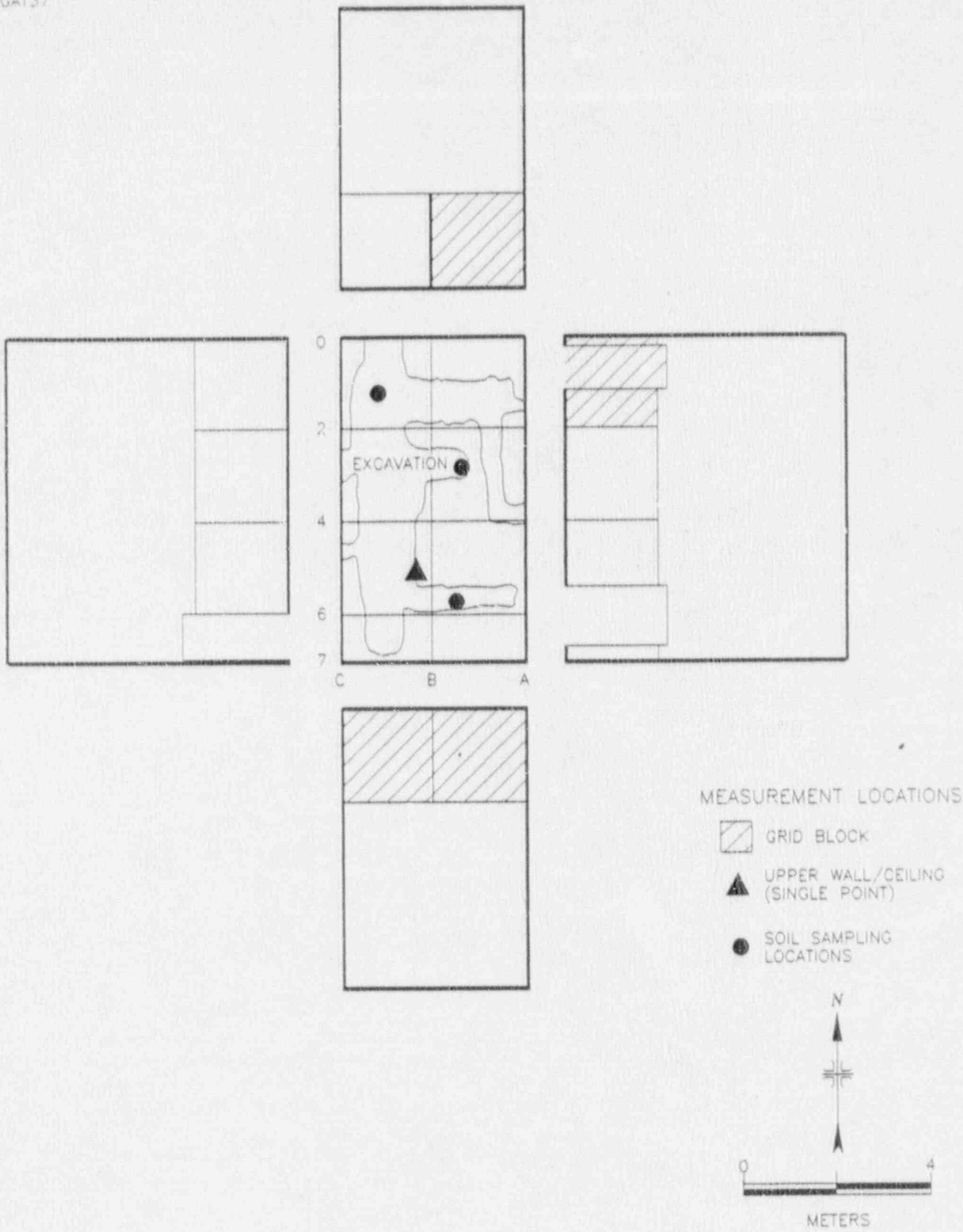

FIGURE 12: Layout of 309, Room 2, Indicating Locations of Sampling and Surface Contamination Measurements

GAT38

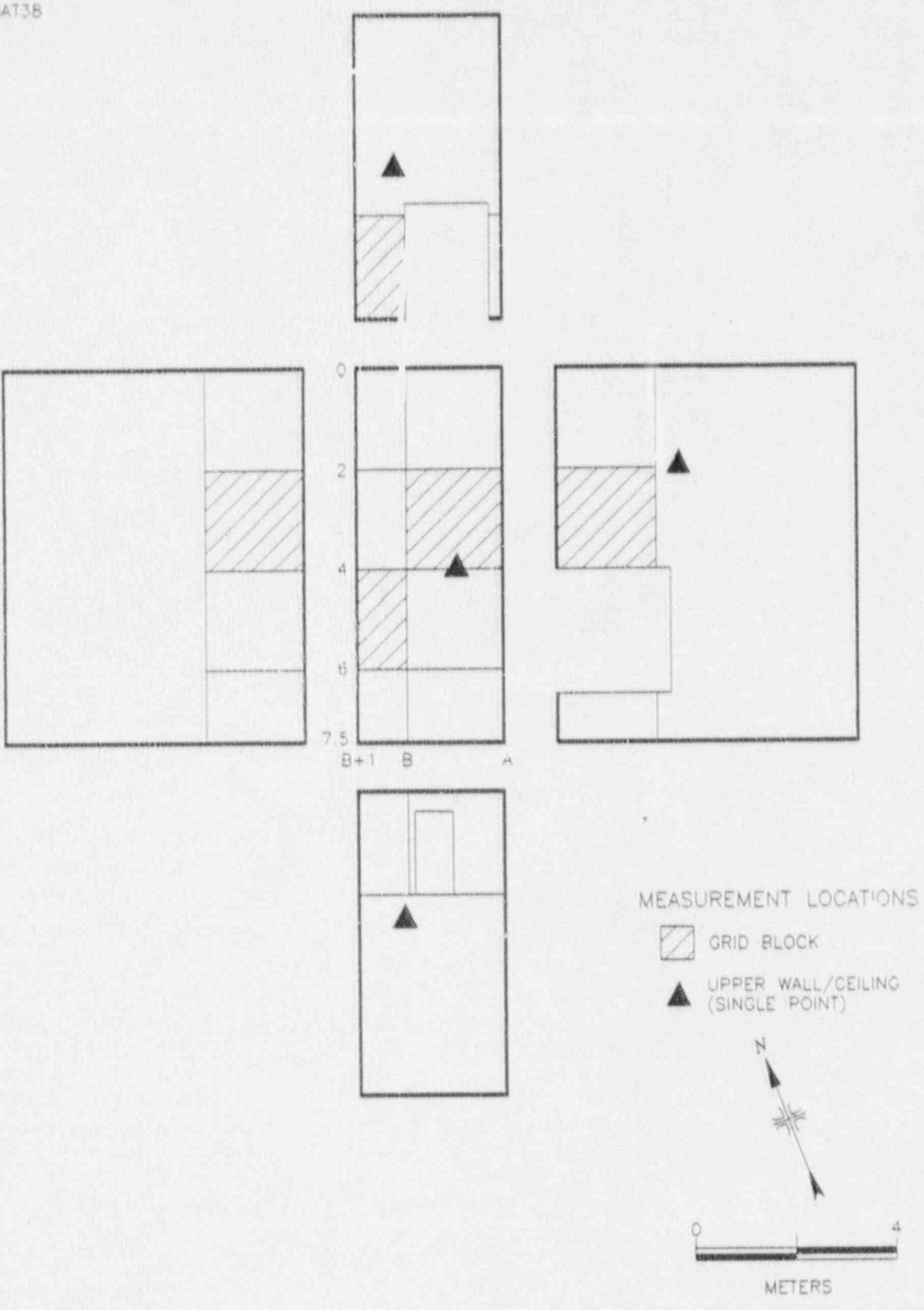

FIGURE 13: Layout of Room 315, Indicating Locations of Surface Contamination Measurements

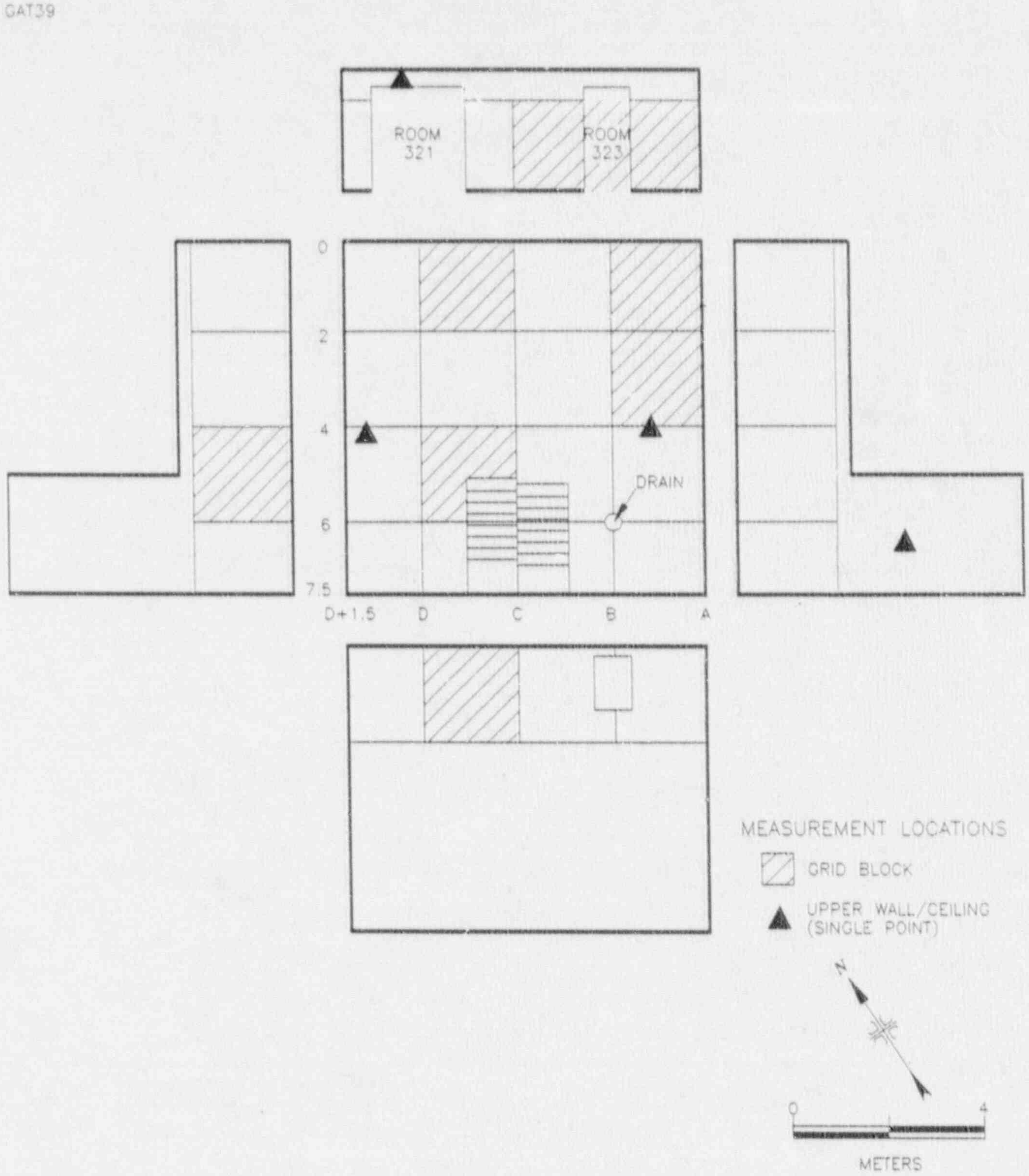

FIGURE 14: Layout of Rooms 321 and 323, Indicating Locations of Surface Contamination Measurements

GAT40

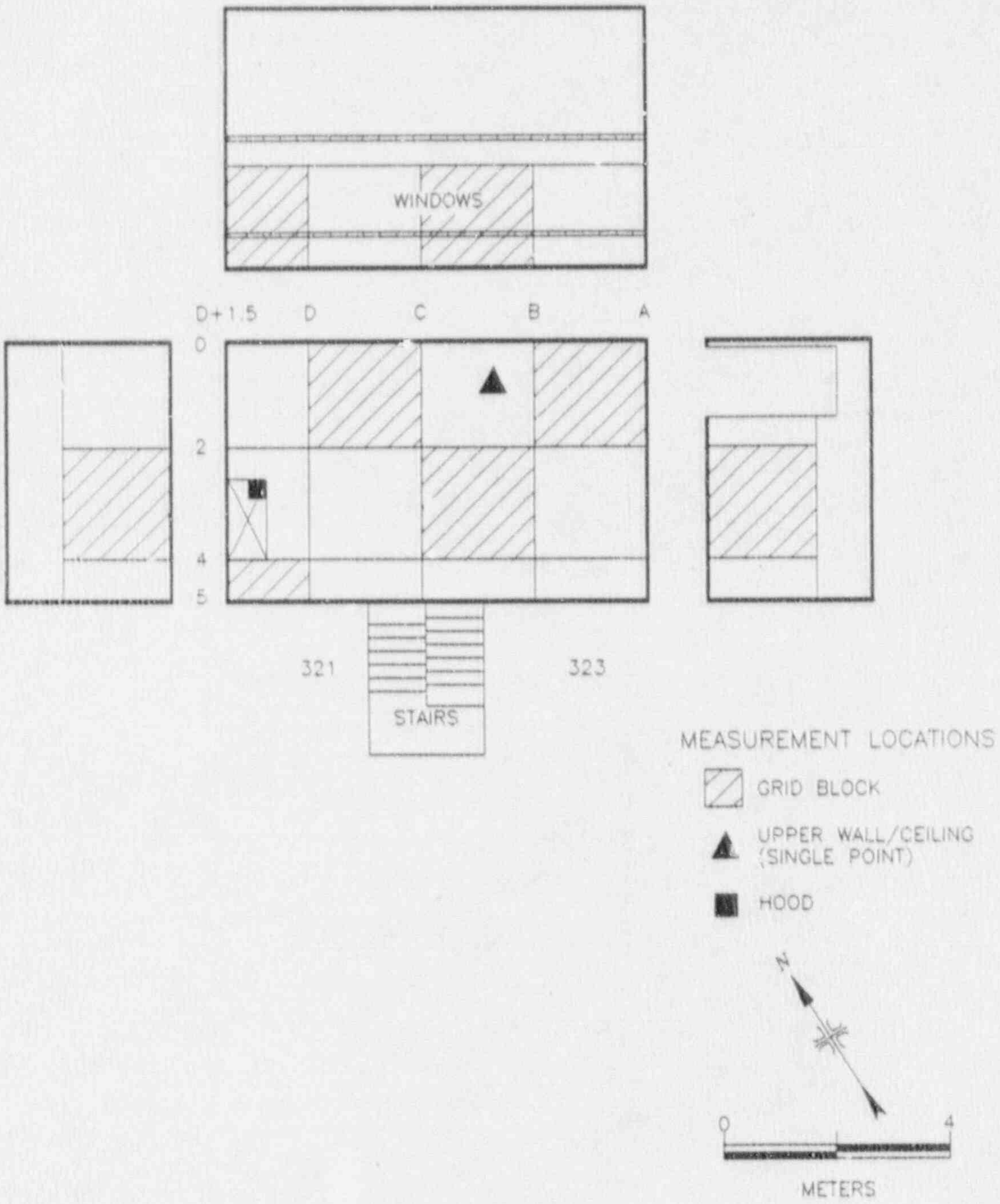

FIGURE 15: Layout of Mezzanine 321/323, Indicating Locations of Surface Contamination Measurements

GAT41

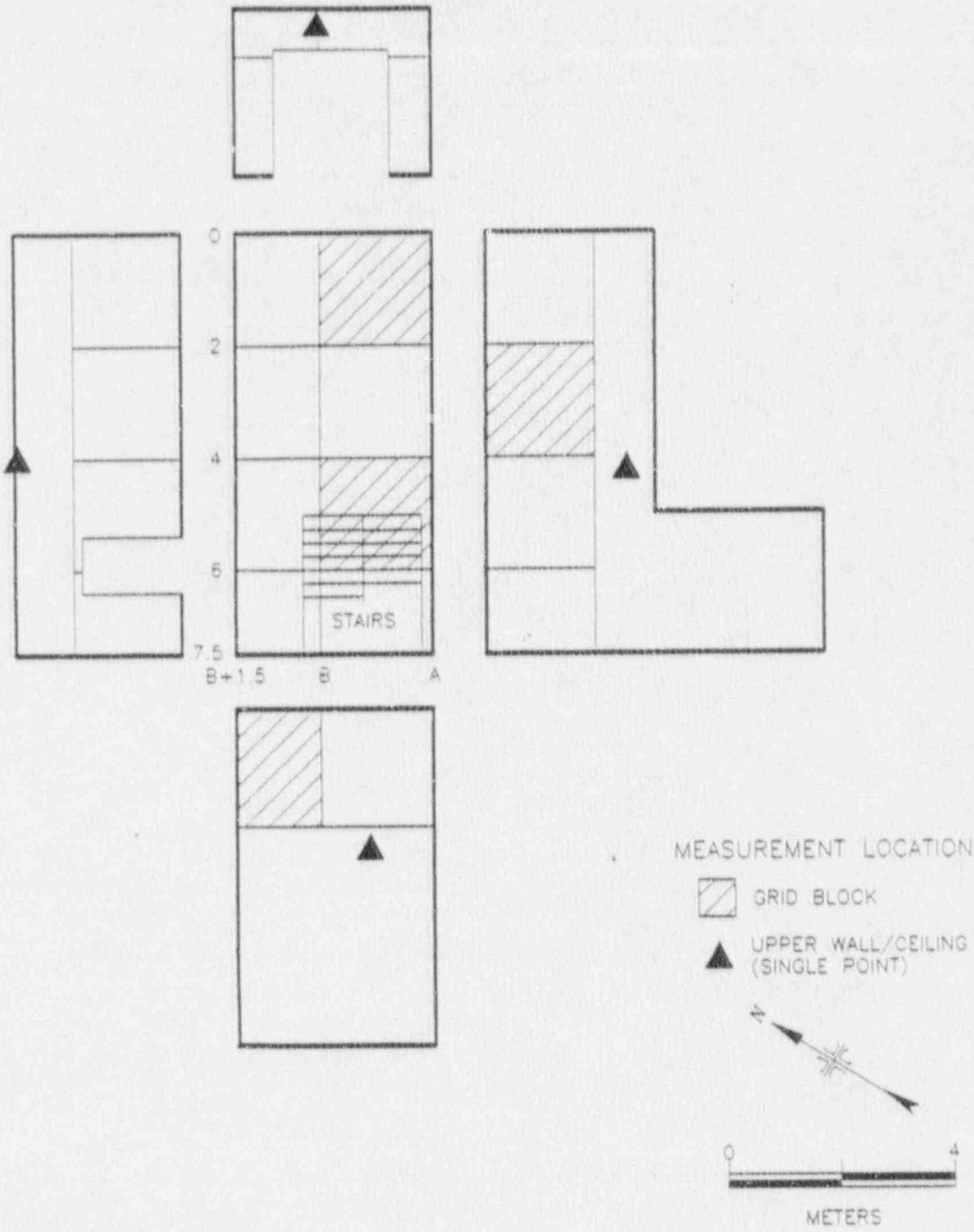

FIGURE 16: Layout of Room 327, Indicating Locations of Surface Contamination Measurements

GAT42

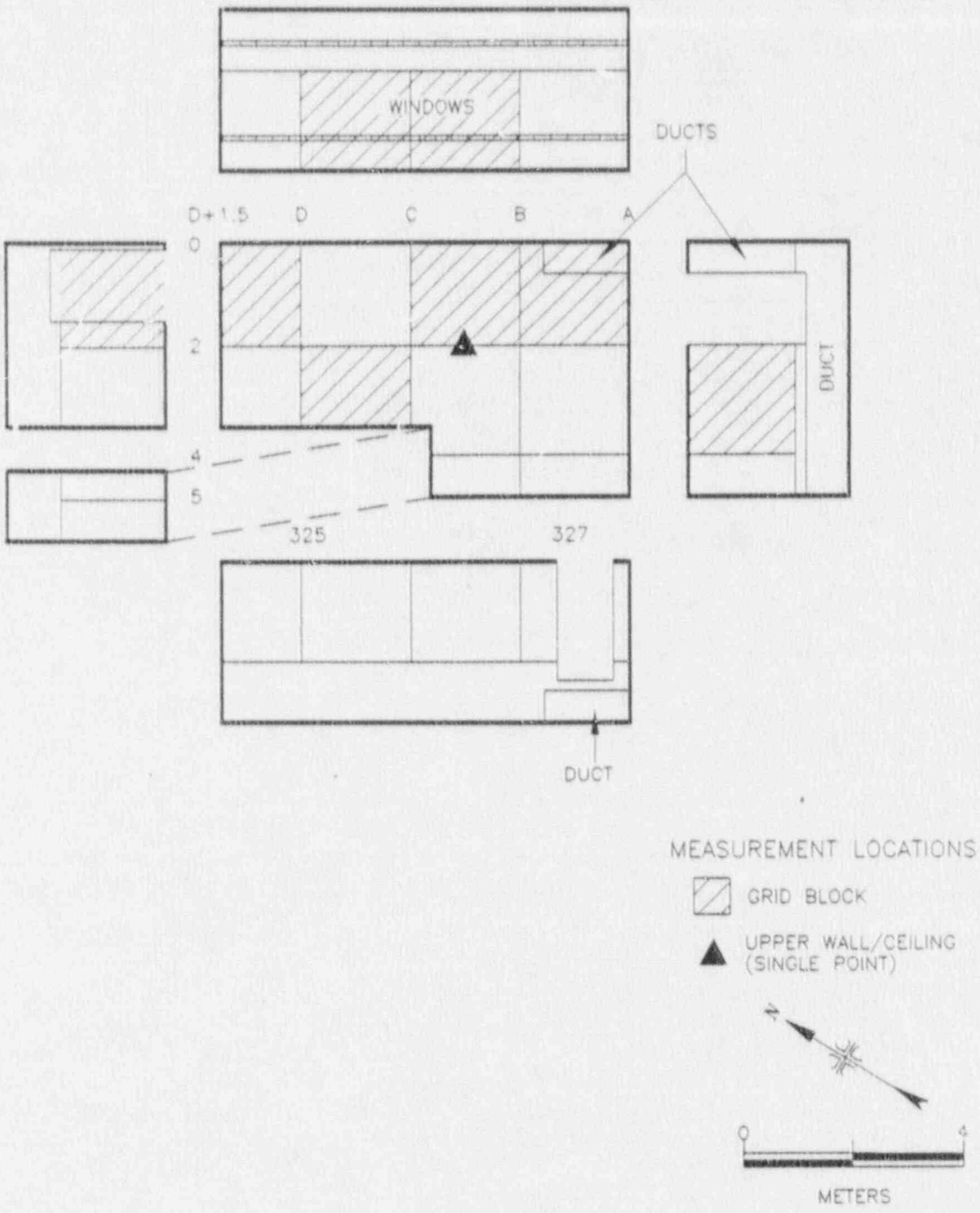

FIGURE 17: Layout of Mezzanine 325/327, Indicating Locations of Surface Contamination Measurements

GAT70

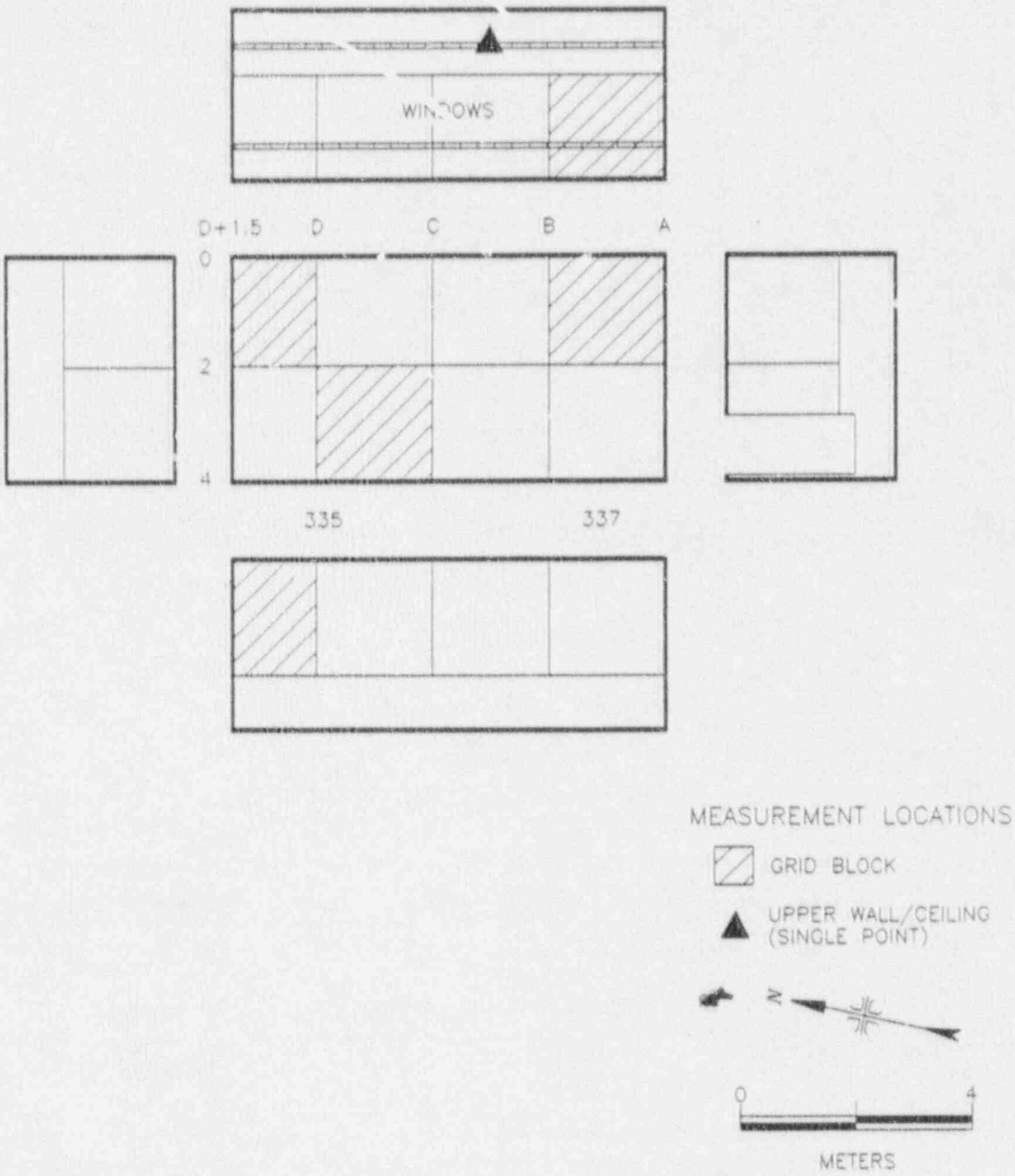

FIGURE 18: Layout of Mezzanine 335/337, Indicating Locations of Surface Contamination Measurements

GAT43

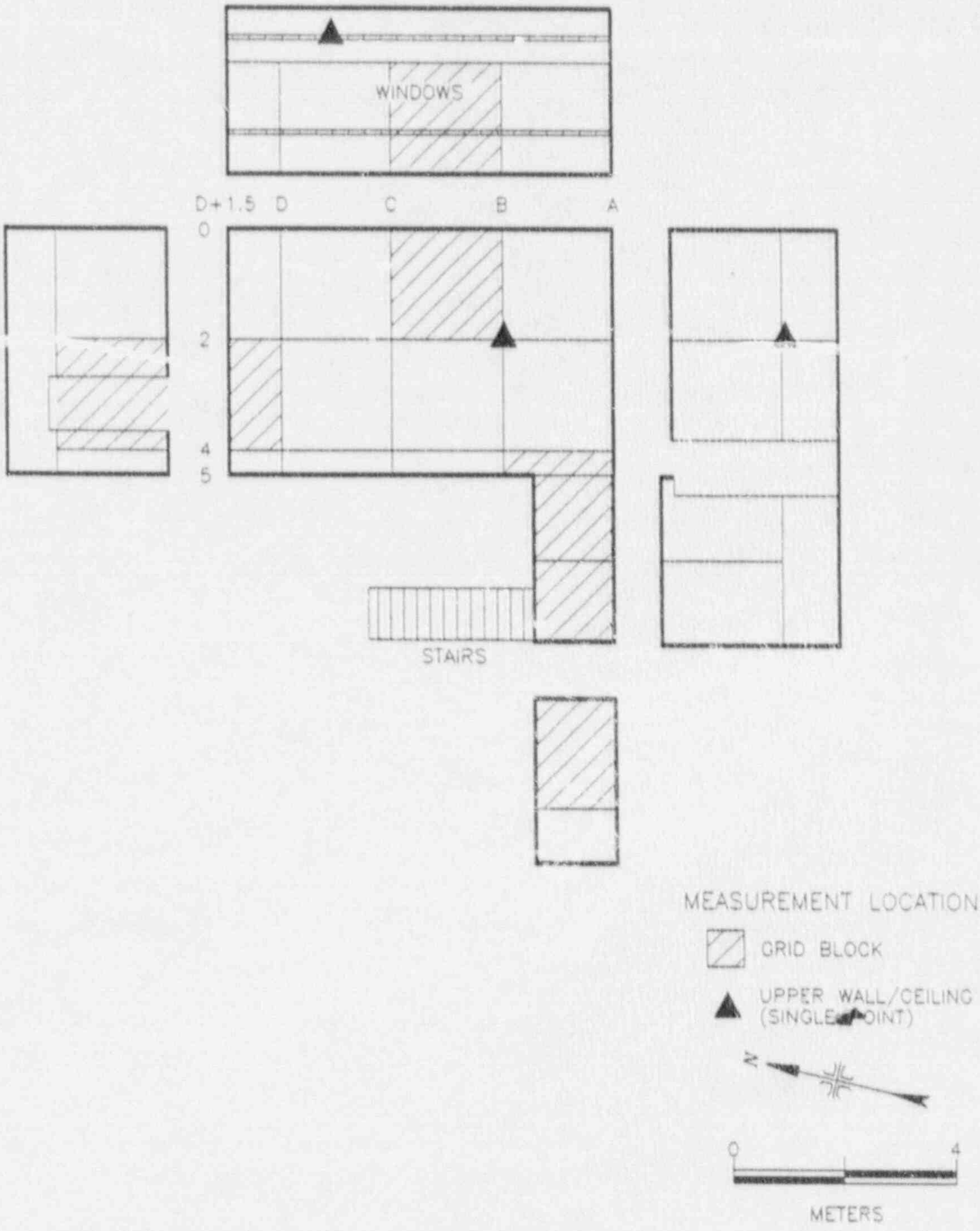

FIGURE 19: Layout of Mezzanine 339/341, Indicating Locations of Surface Contamination Measurements

CAT44

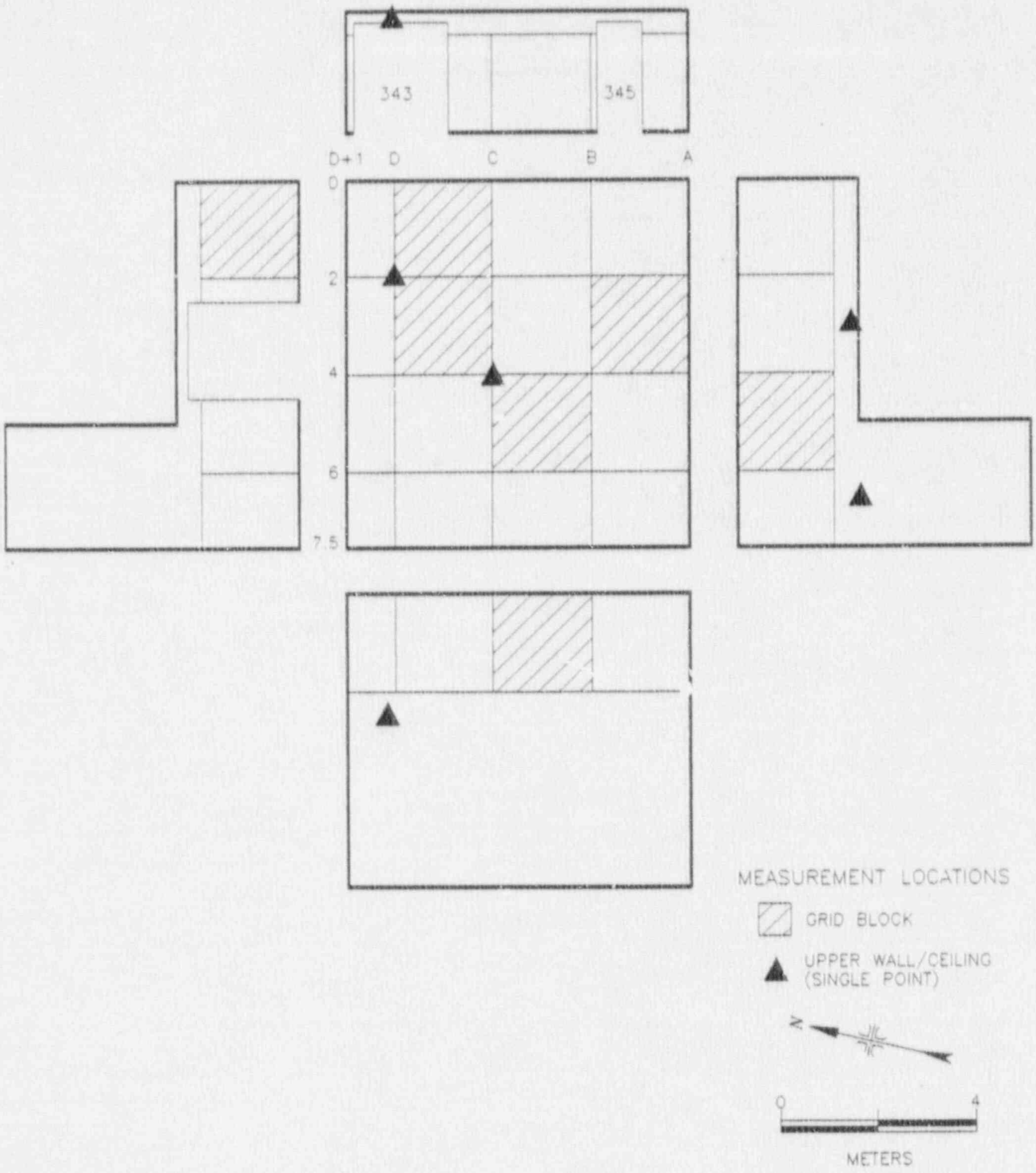

FIGURE 20: Layout of Rooms 343/345, Indicating Locations of Surface Contamination Measurements

GAT45

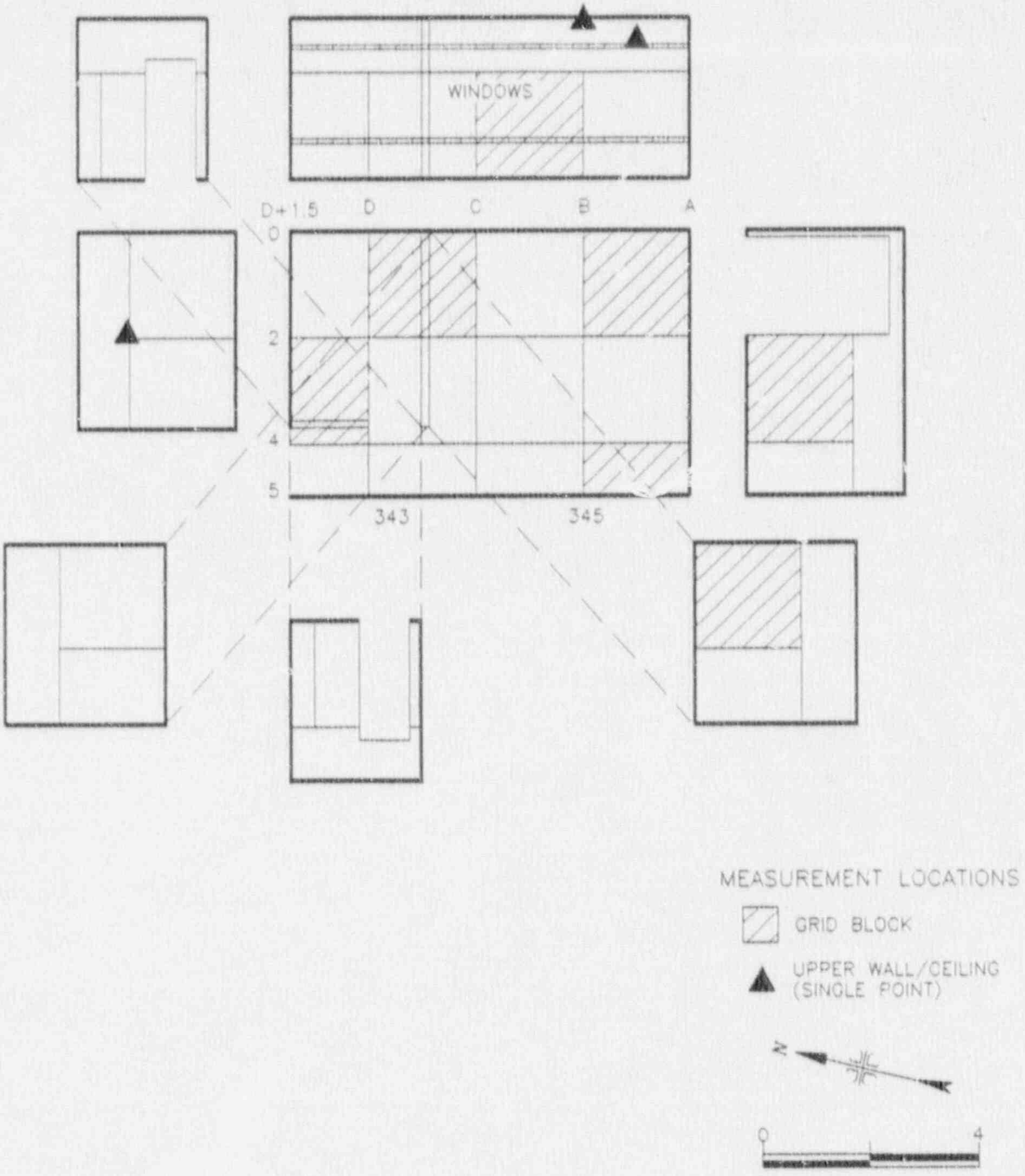

FIGURE 21: Layout of Mezzanine 343/345, Indicating Locations of Surface Contamination Measurements

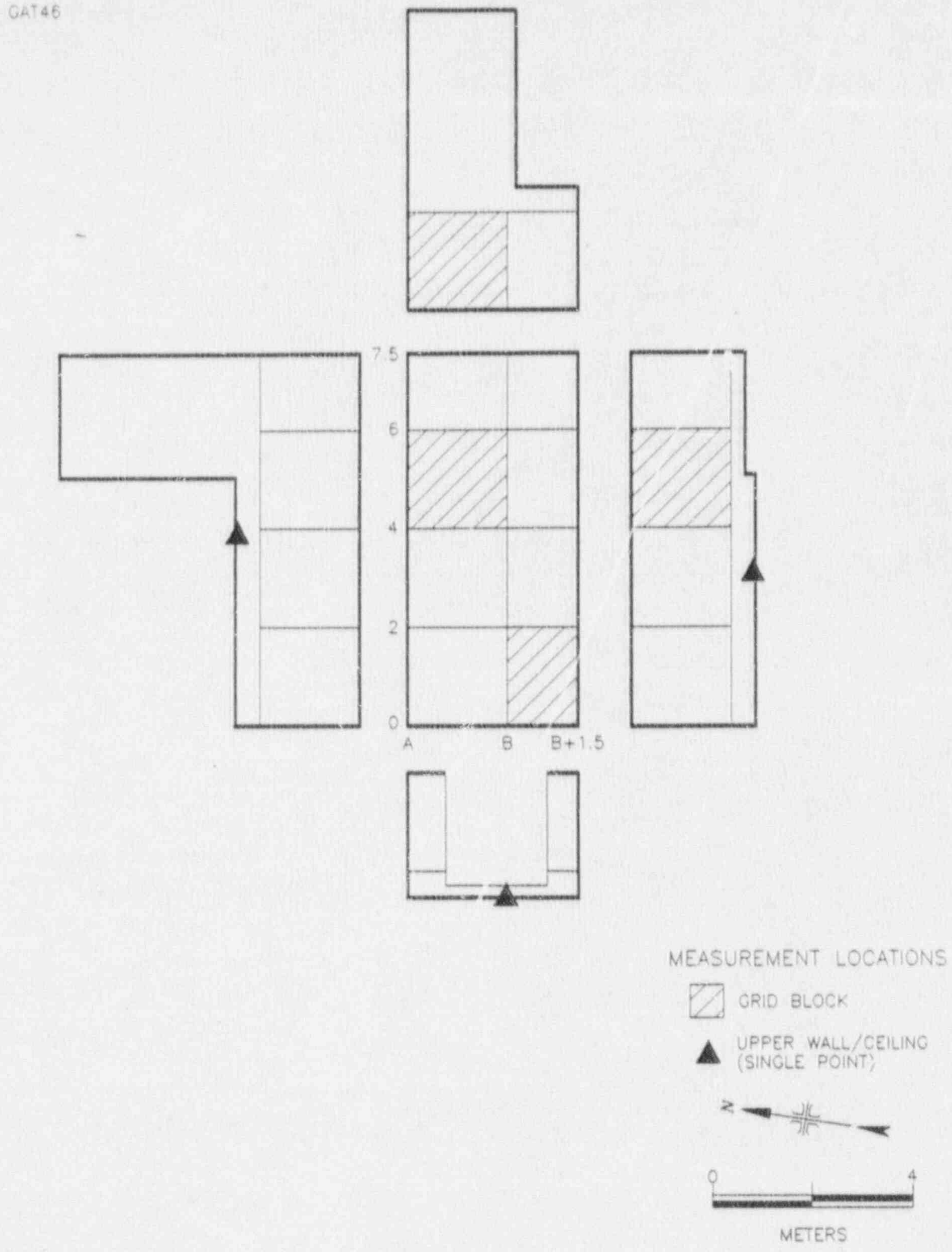

FIGURE 22: Layout of Room 347, Indicating Locations of Surface Contamination Measurements

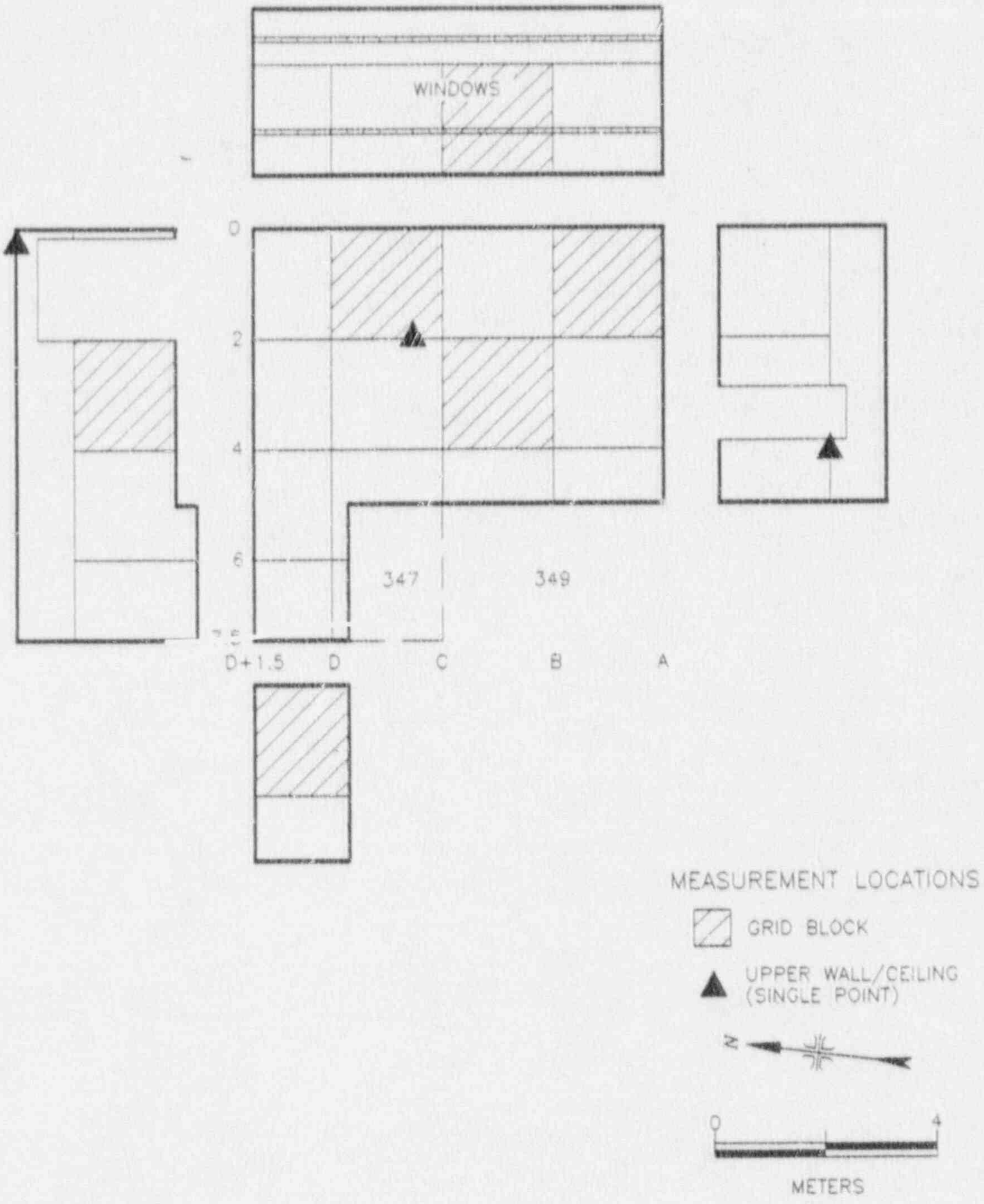

FIGURE 23: Layout of Mezzanine 347/349, Indicating Locations of Surface Contamination Measurements

GAT48

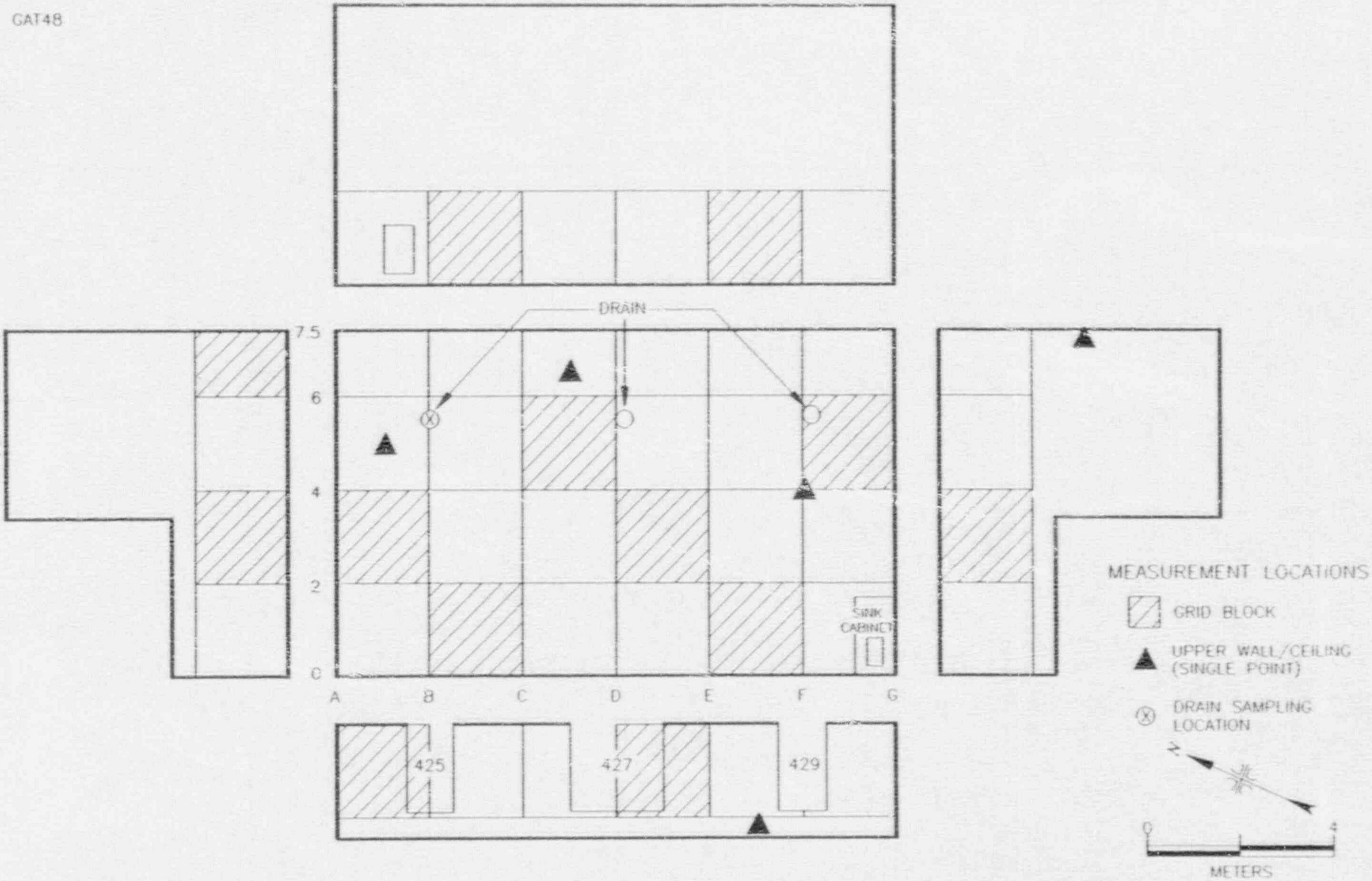

FIGURE 24: Layout of Rooms 425, 427, and 429, Indicating Locations of Surface Contamination Measurements

GAT49

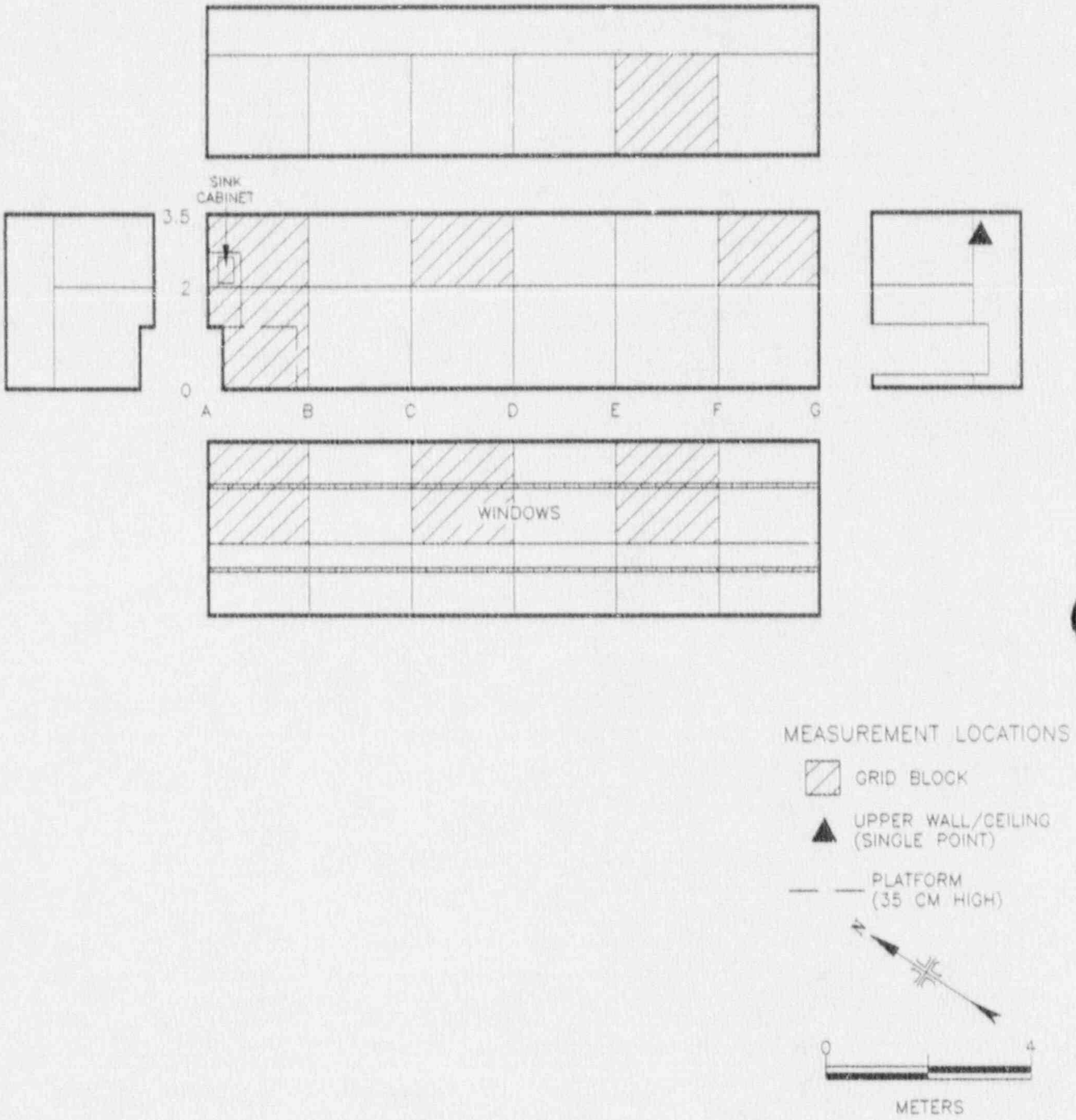

FIGURE 25: Layout of Mezzanine 425, 427, and 429, Indicating Locations of Surface Contamination Measurements

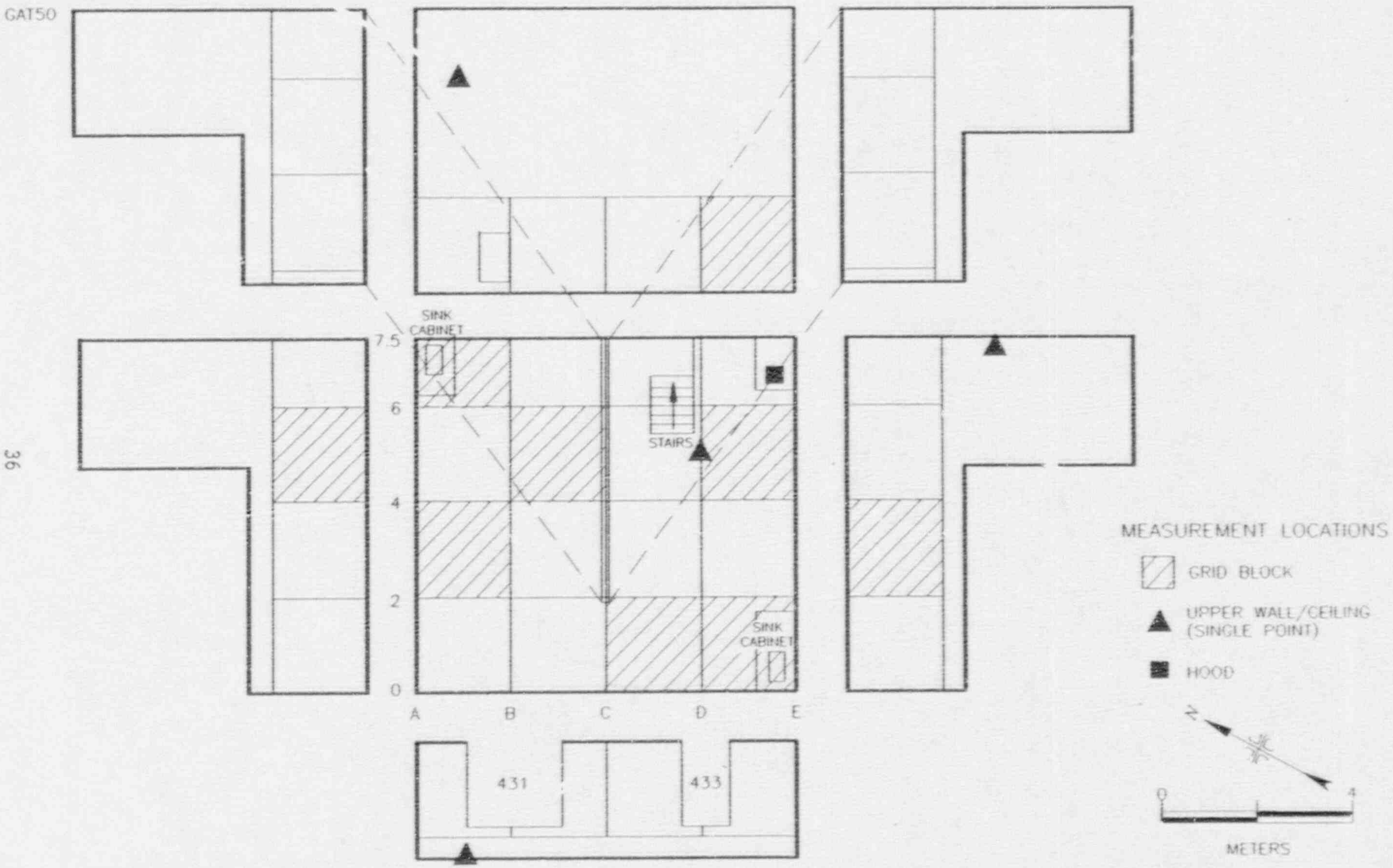

FIGURE 26: Layout of Rooms 431 and 433, Indicating Locations of Surface Contamination Measurements

OATS1

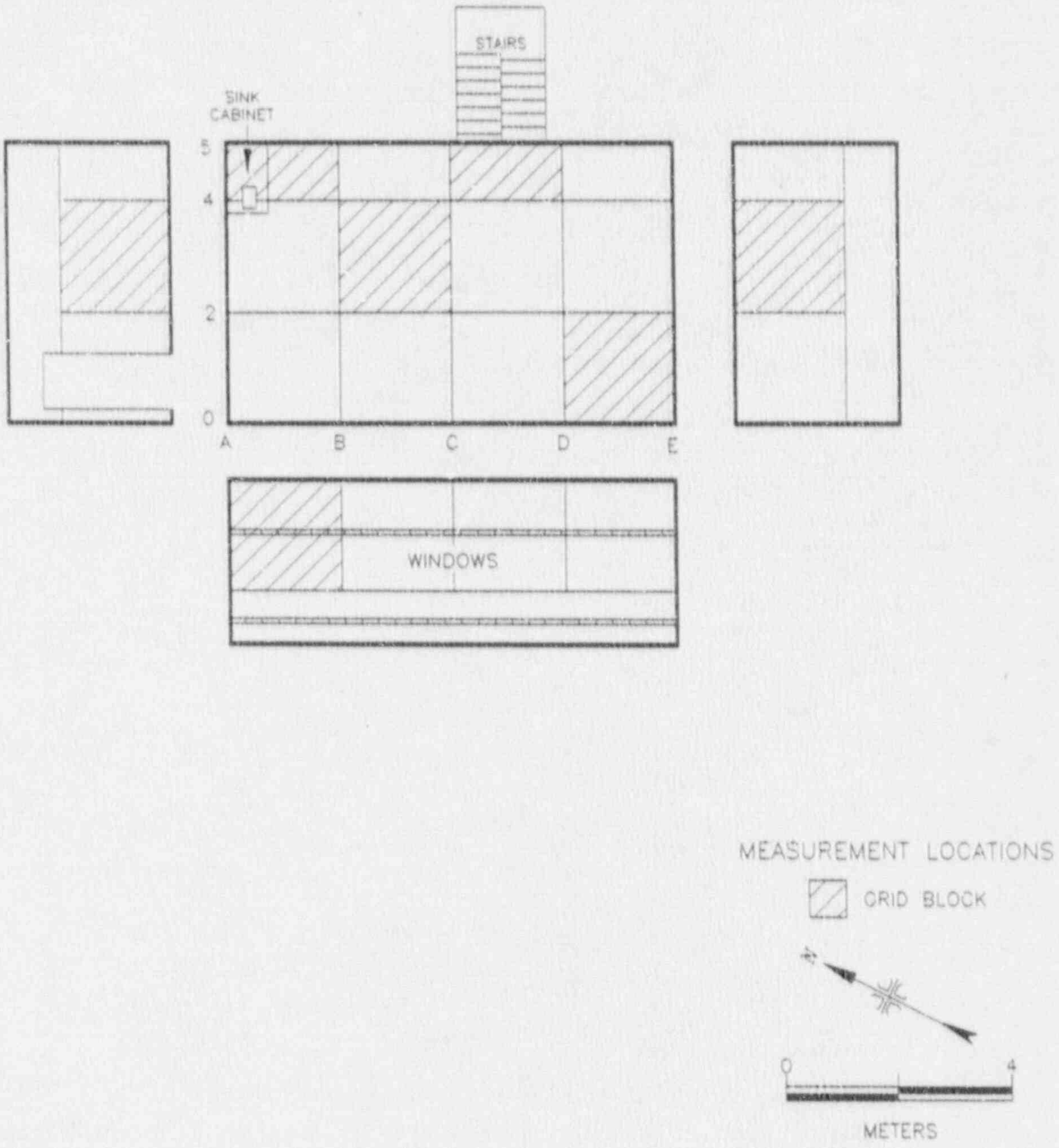

FIGURE 27: Layout of Mezzanine 431/433, Indicating Locations of Surface Contamination Measurements

GAT52

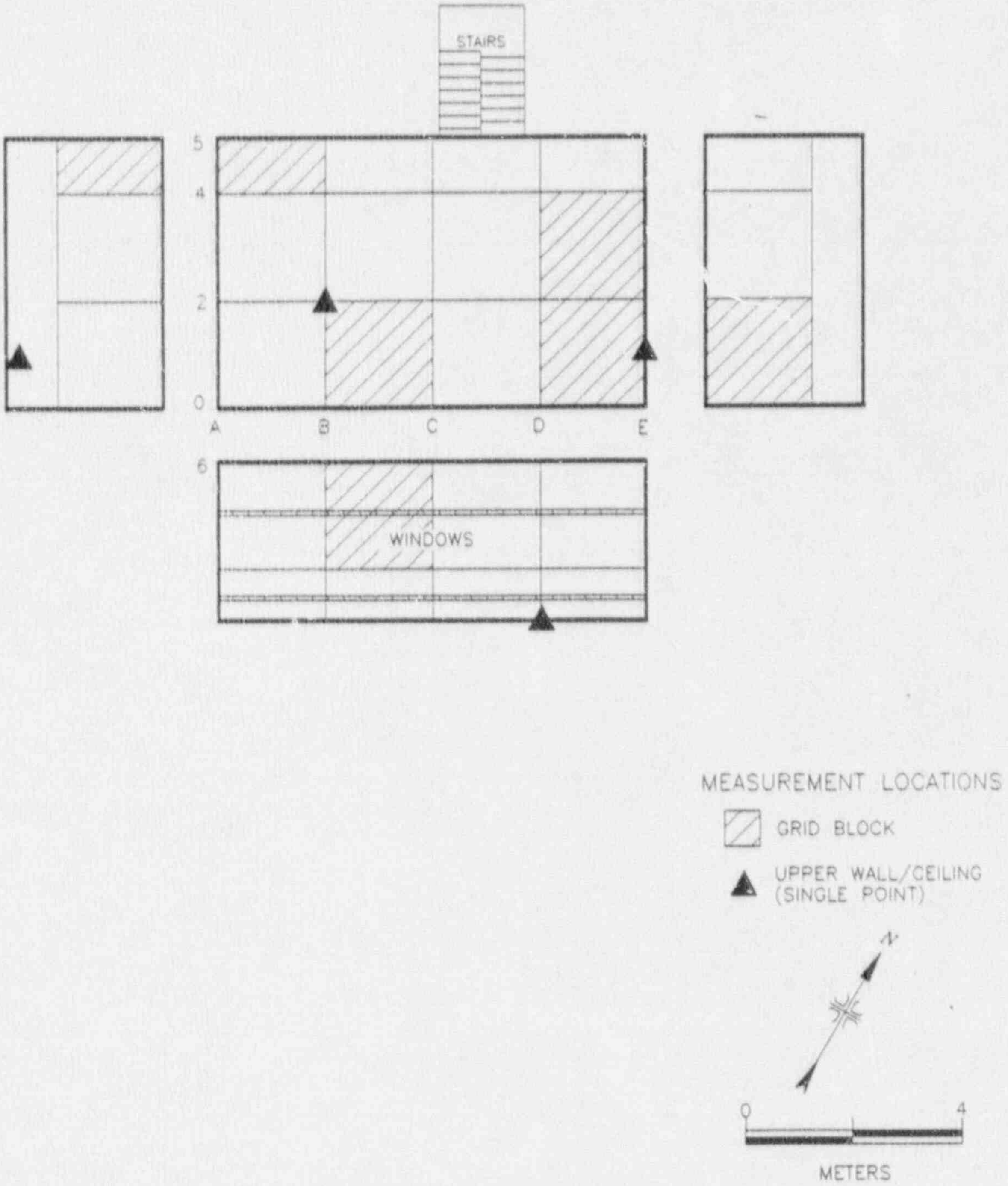

FIGURE 28: Layout of Mezzanine 615/617, Indicating Locations of Surface Contamination Measurements

GAT53

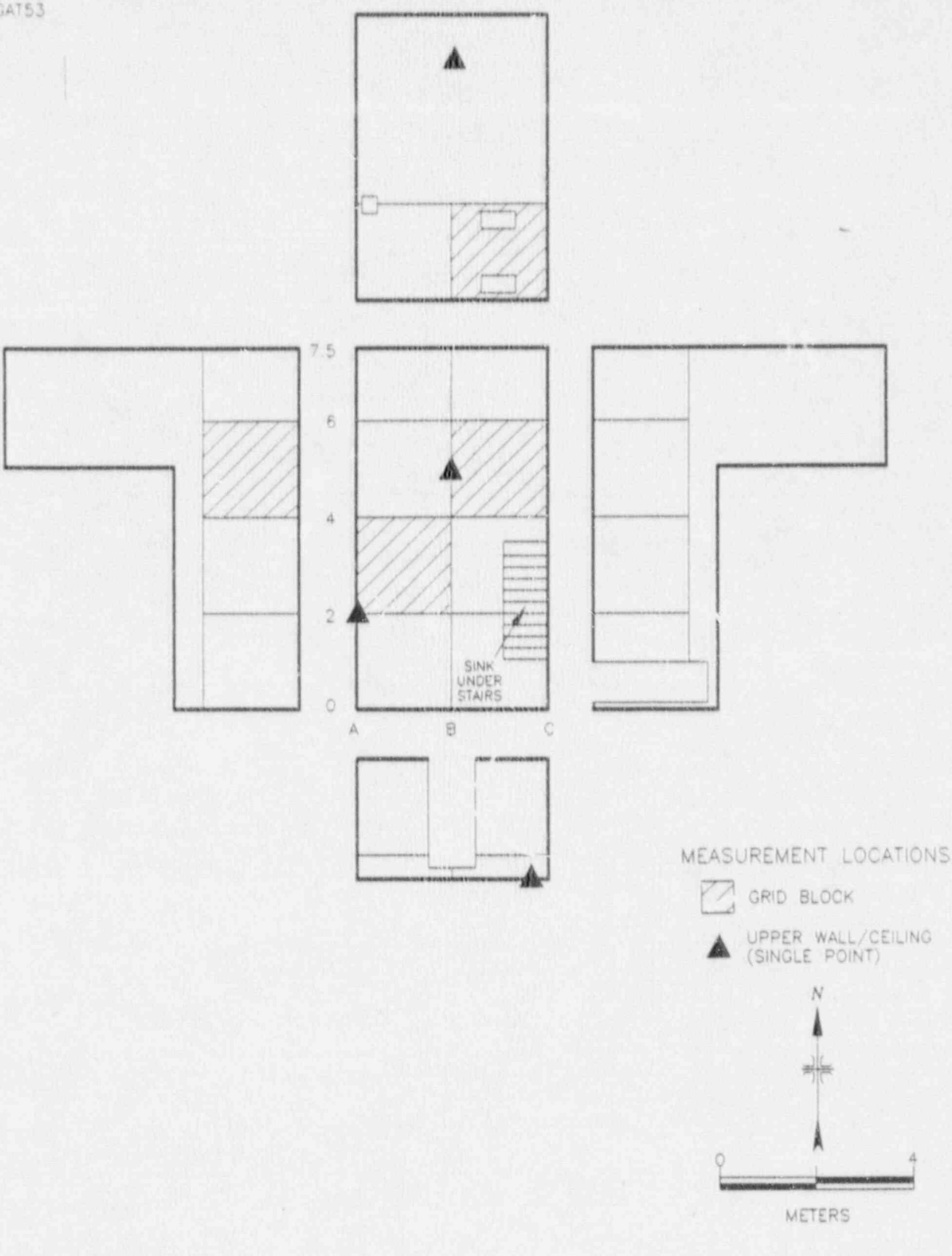

FIGURE 29: Layout of Room 647, Indicating Locations of Surface Contamination Measurements

GAT54

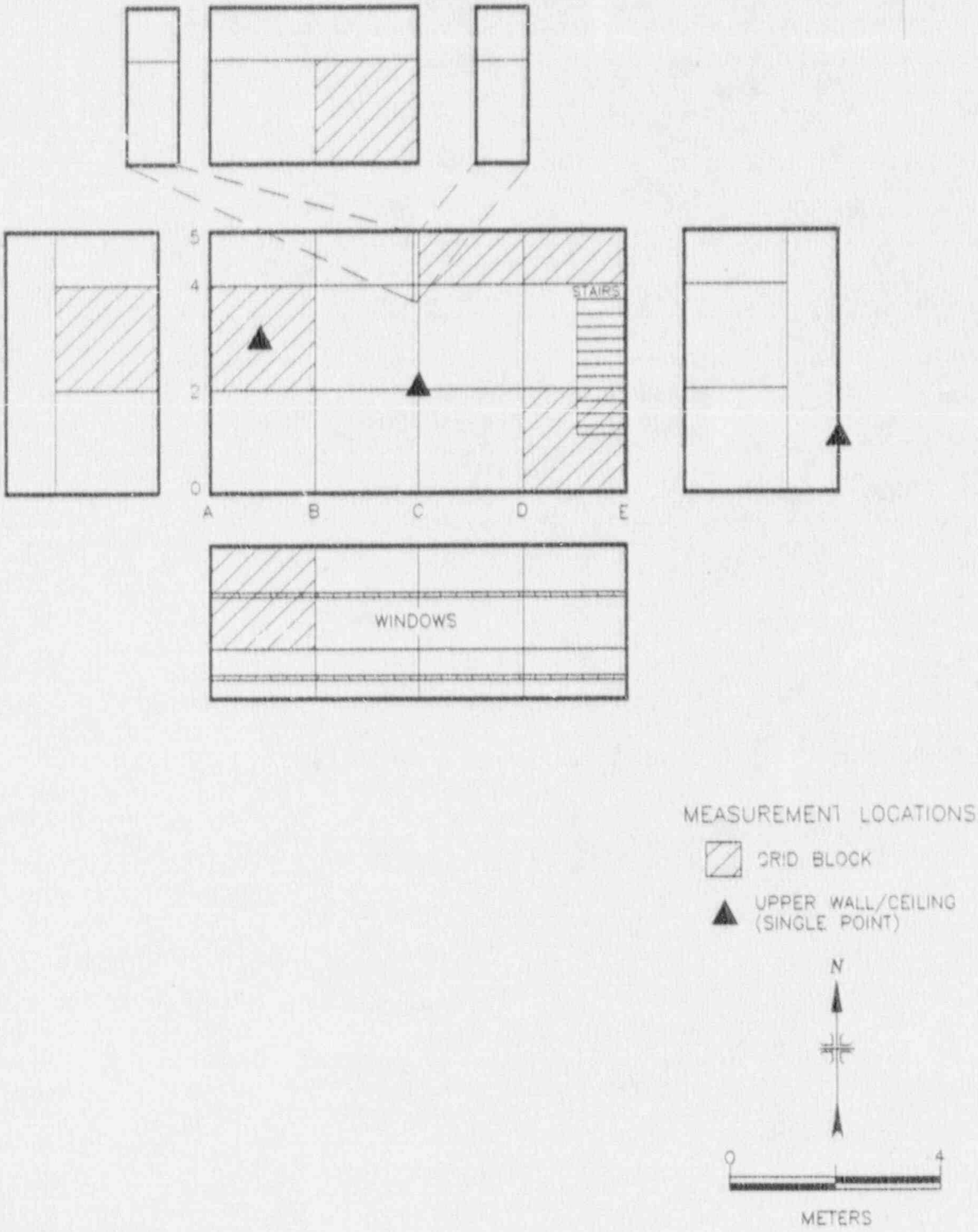

FIGURE 30: Layout of Mezzanine 645/647, Indicating Locations of Surface Contamination Measurements

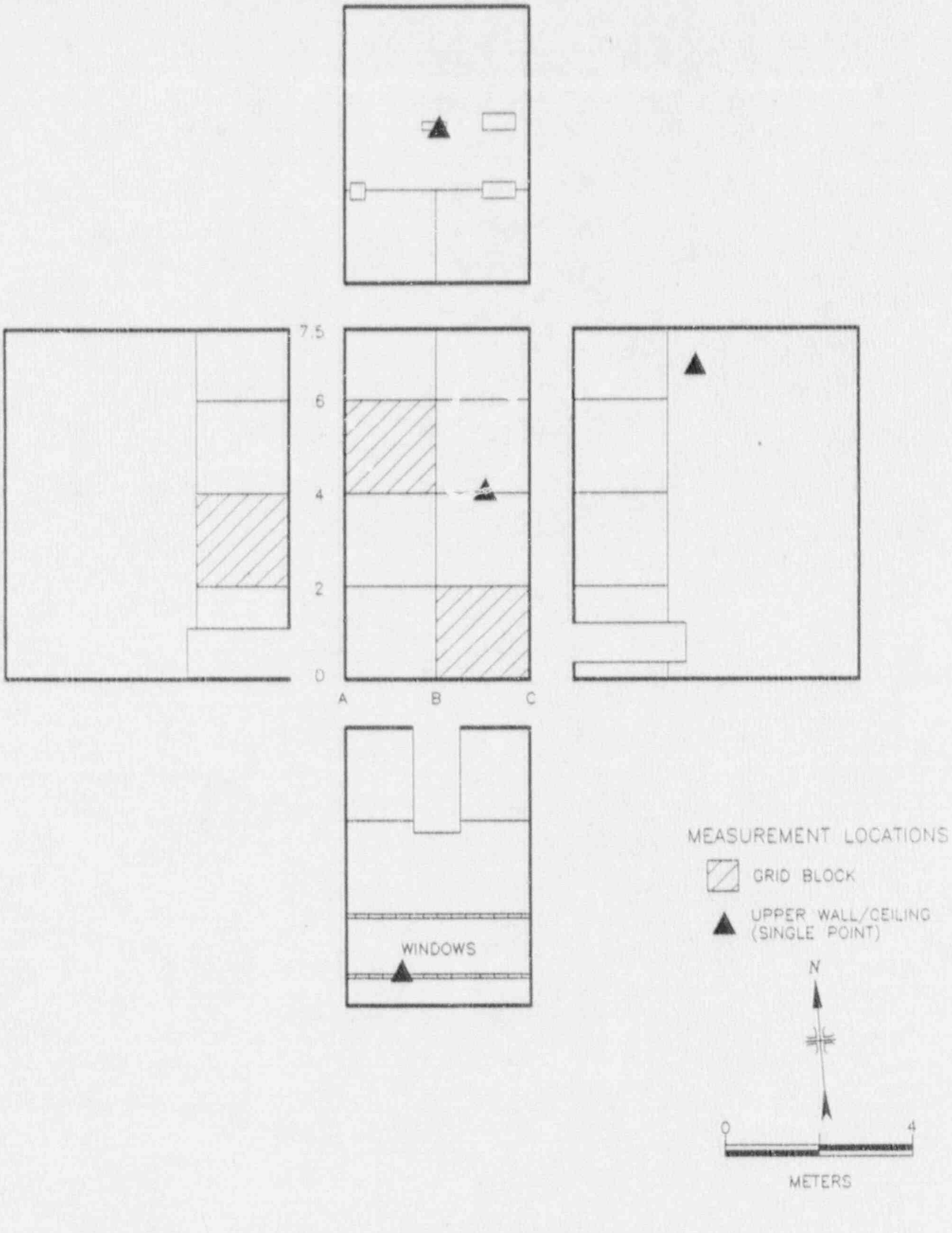

FIGURE 31: Layout of Room 649, Indicating Locations of Surface Contamination Measurements

GAT56

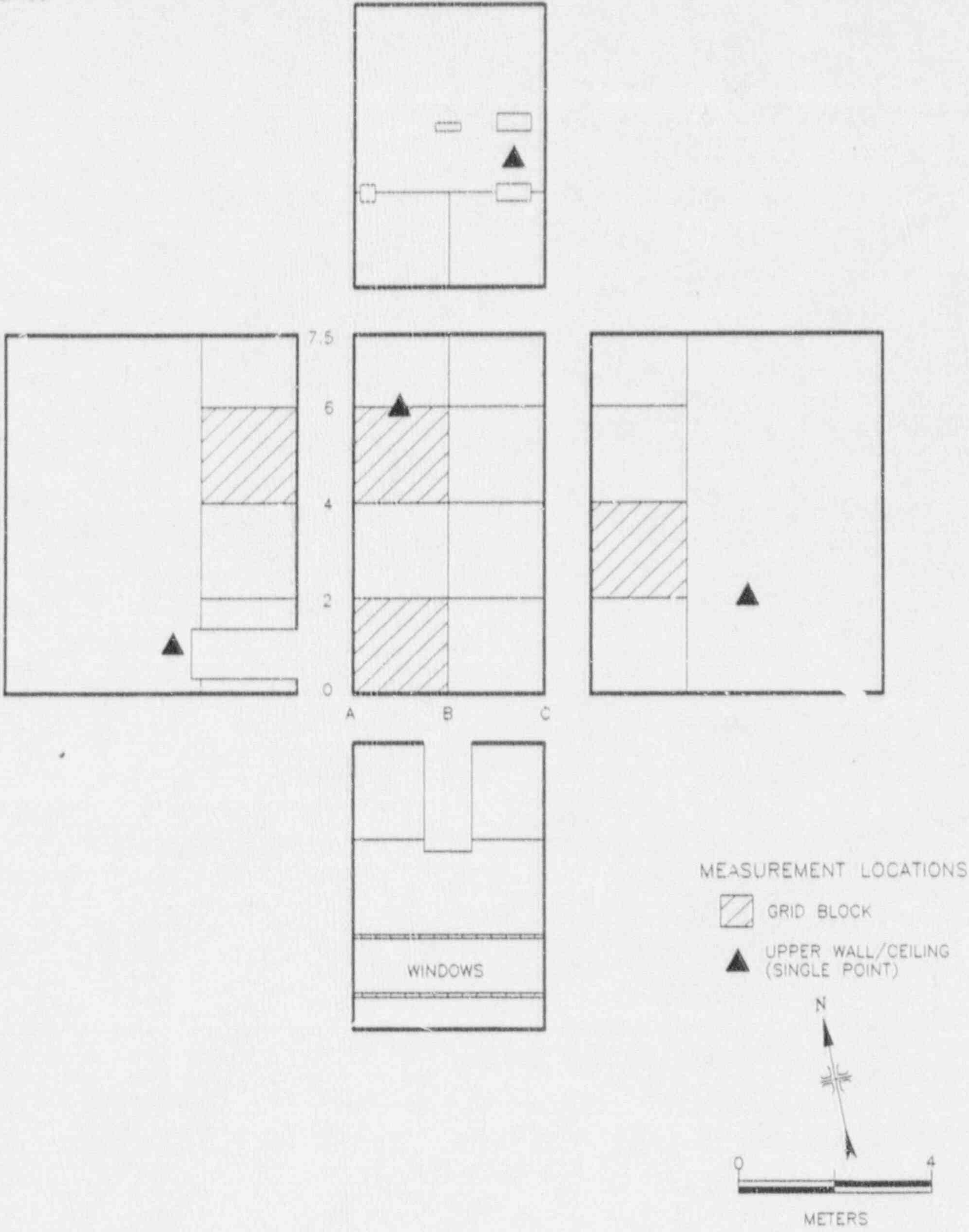

FIGURE 32: Layout of Room 651, Indicating Locations of Surface Contamination Measurements

GAT57

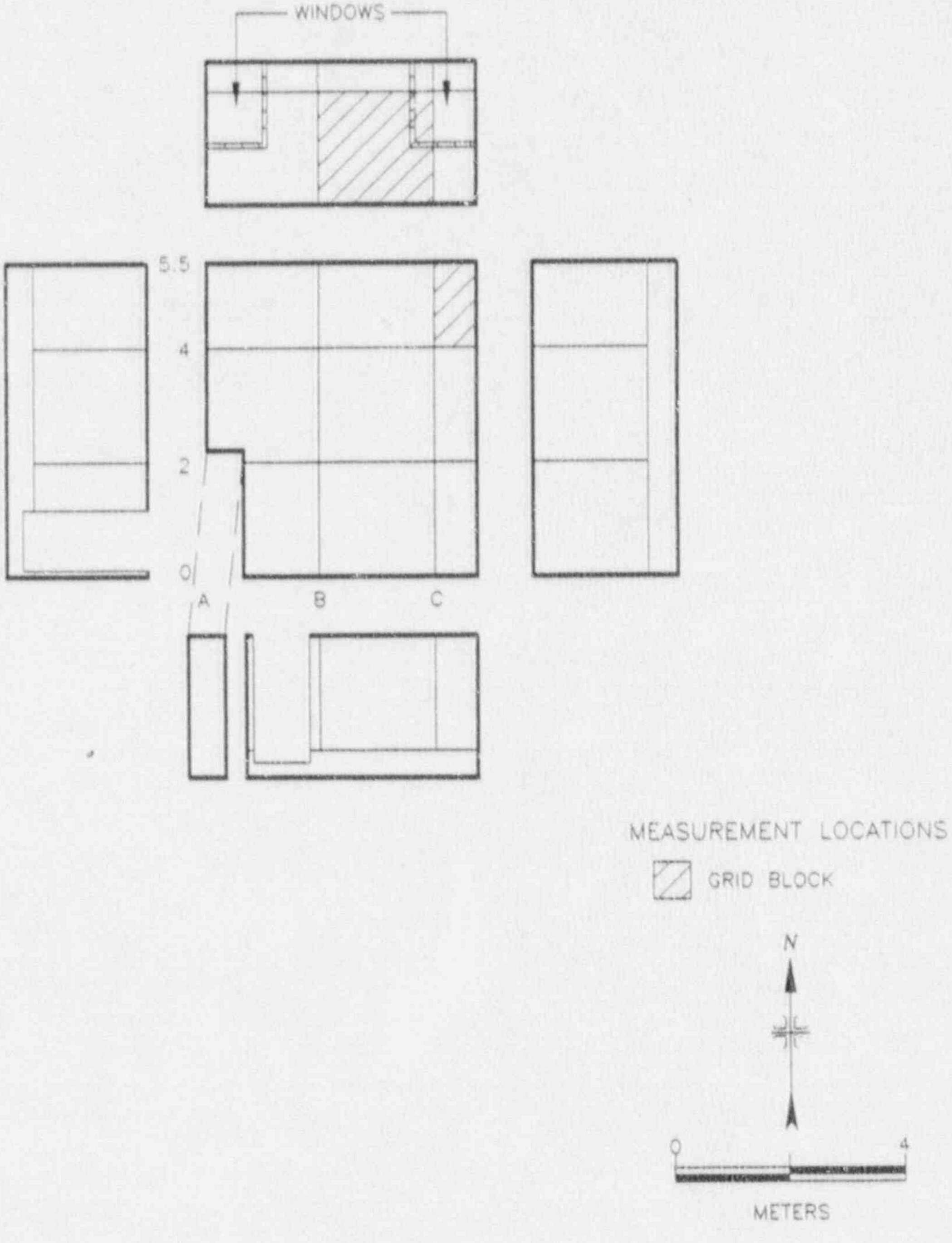

FIGURE 33: Layout of Room 33, Indicating Locations of Surface Contamination Measurements

GAT58

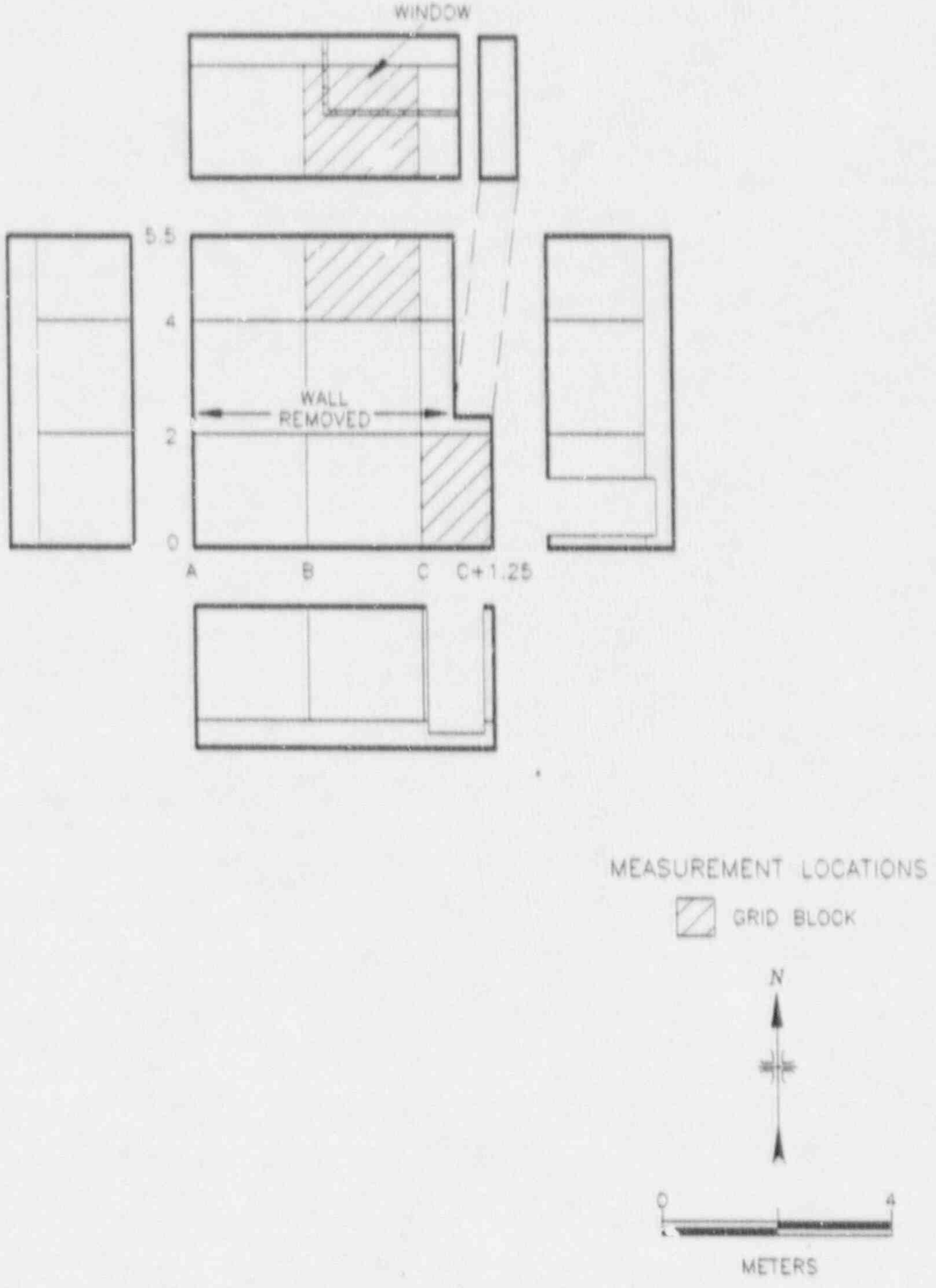

FIGURE 34: Layout of Room 34, Indicating Locations of Surface Contamination Measurements

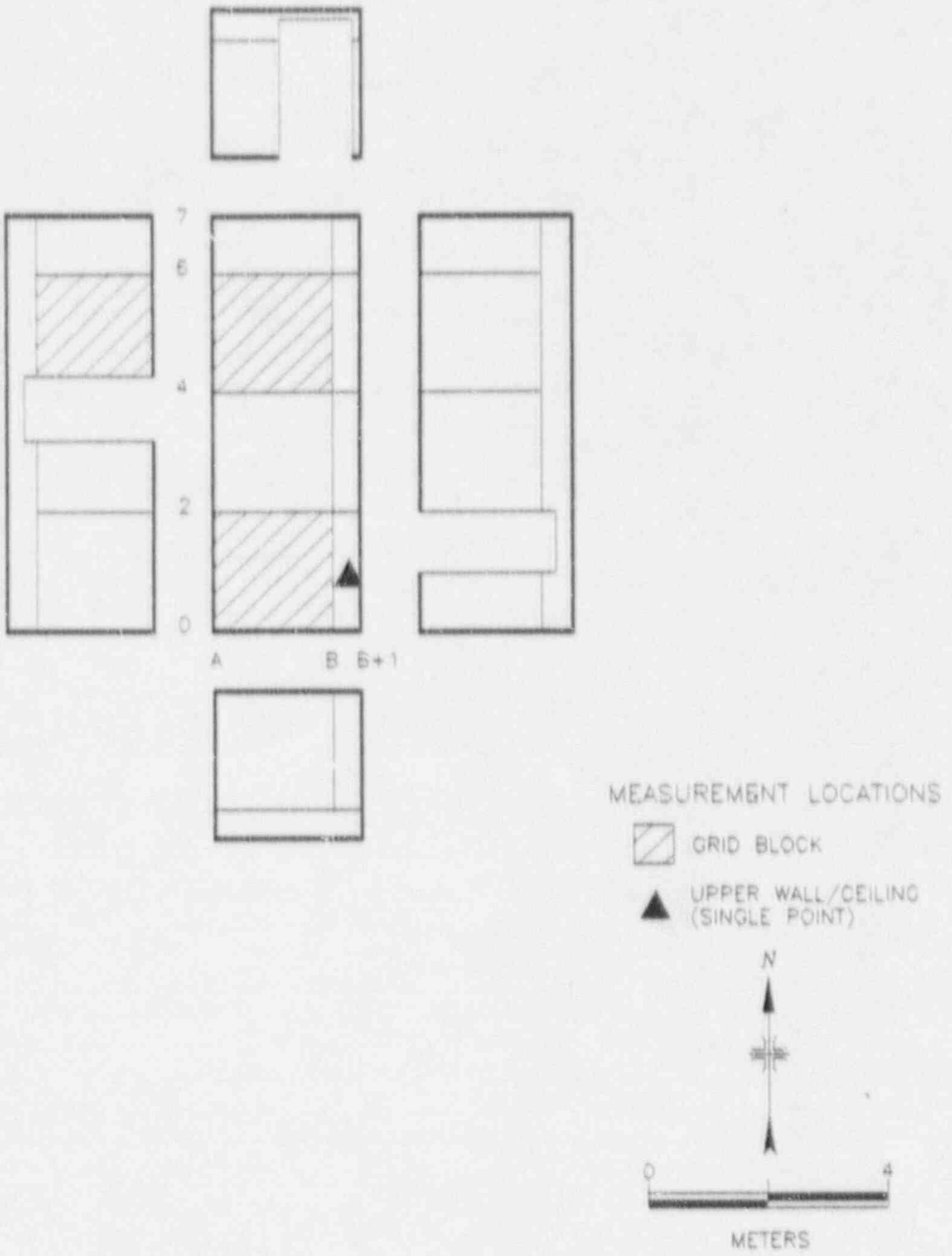

FIGURE 35: Layout of Room 38, Indicating Locations of Surface Contamination Measurements

GAT60

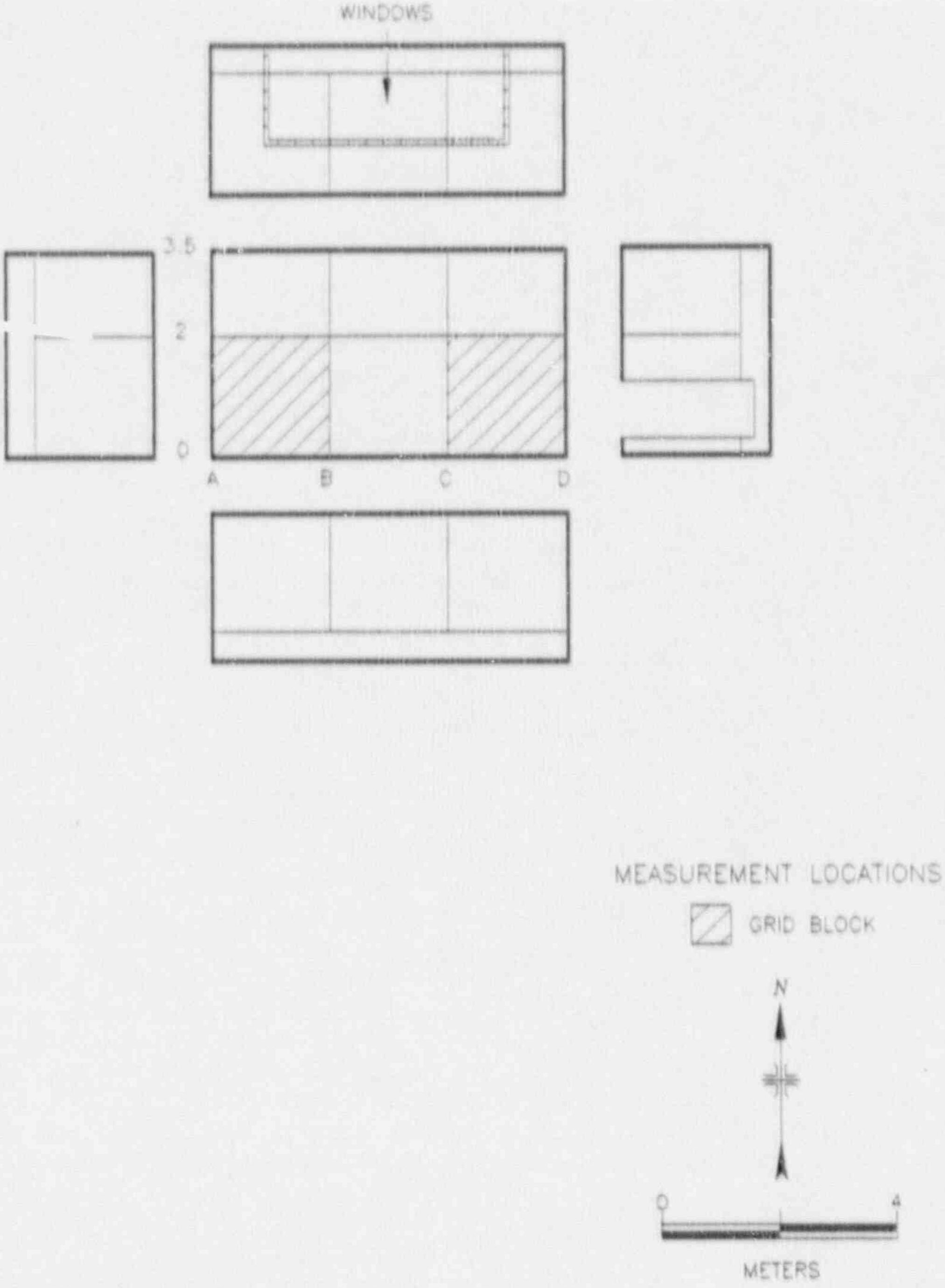

FIGURE 36: Layout of Room 39, Indicating Locations of Surface Contamination Measurements

GAT61

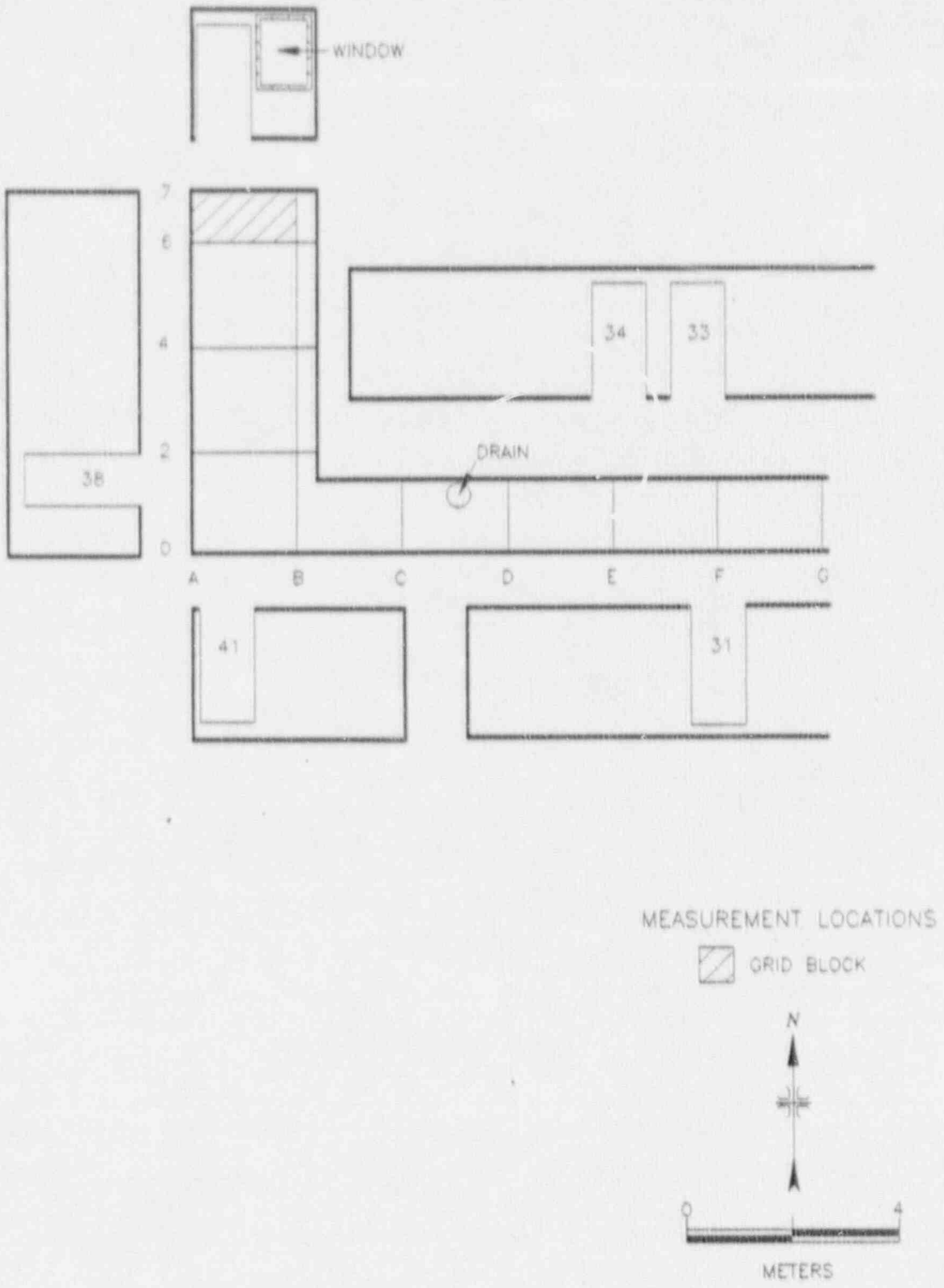

FIGURE 37: Layout of Main Entrance Hallway, Indicating Locations of Surface Contamination Measurements

GAT62

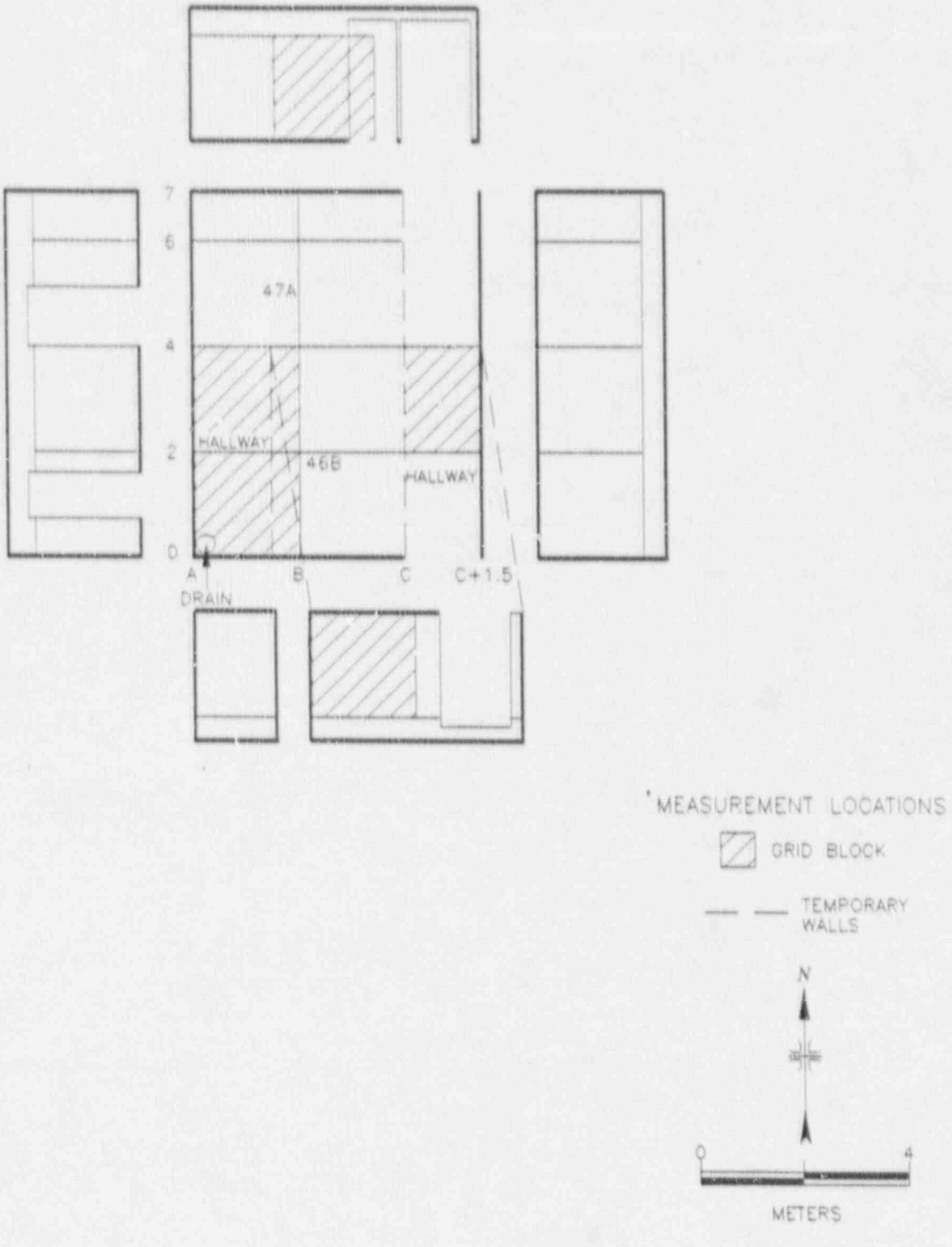

FIGURE 38: Layout of Rooms 47A and 46B (Old Change Room), Indicating Locations of Surface Contamination Measurements

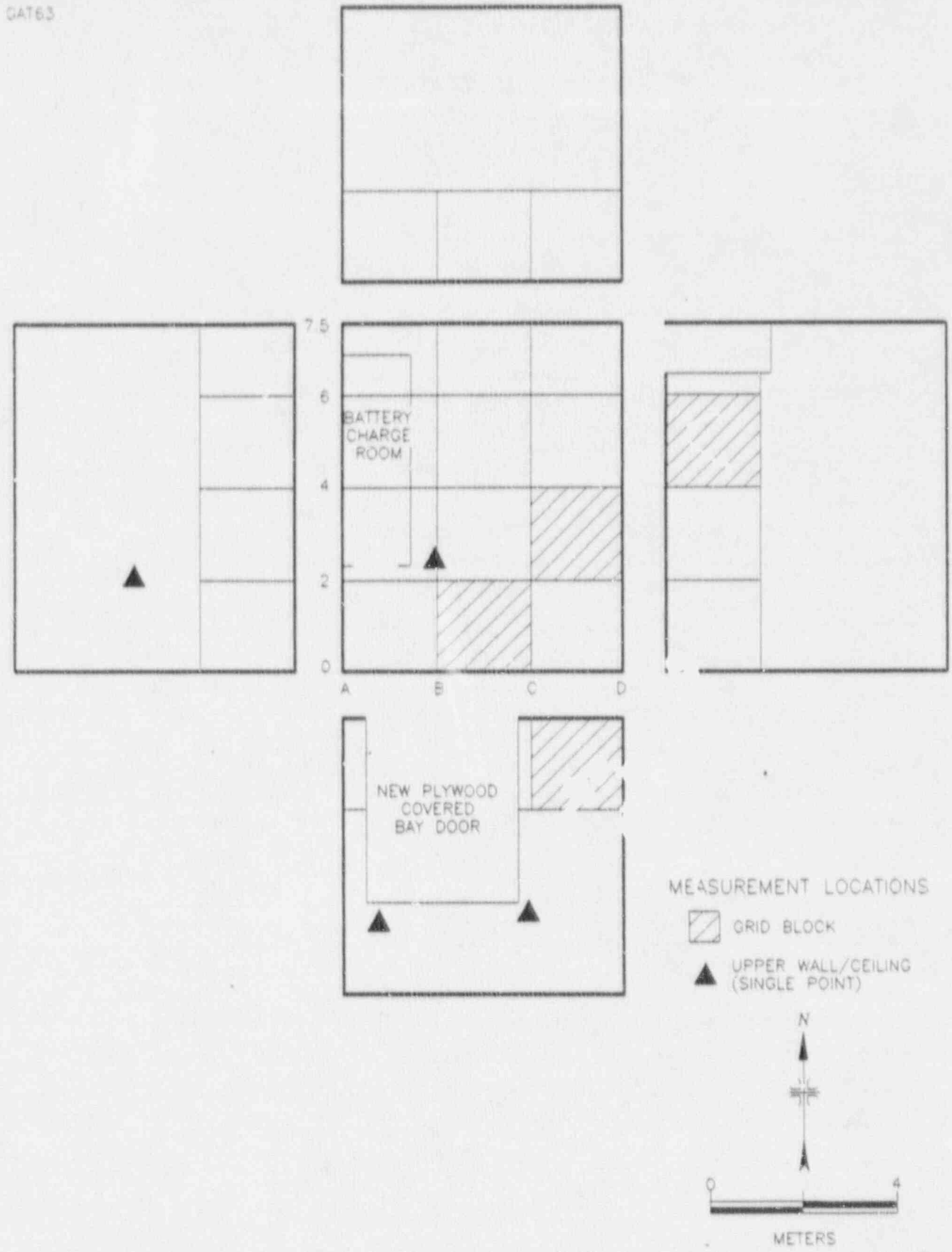

FIGURE 39: Layout of Room 48, Indicating Locations of Surface Contamination Measurements

GAT64

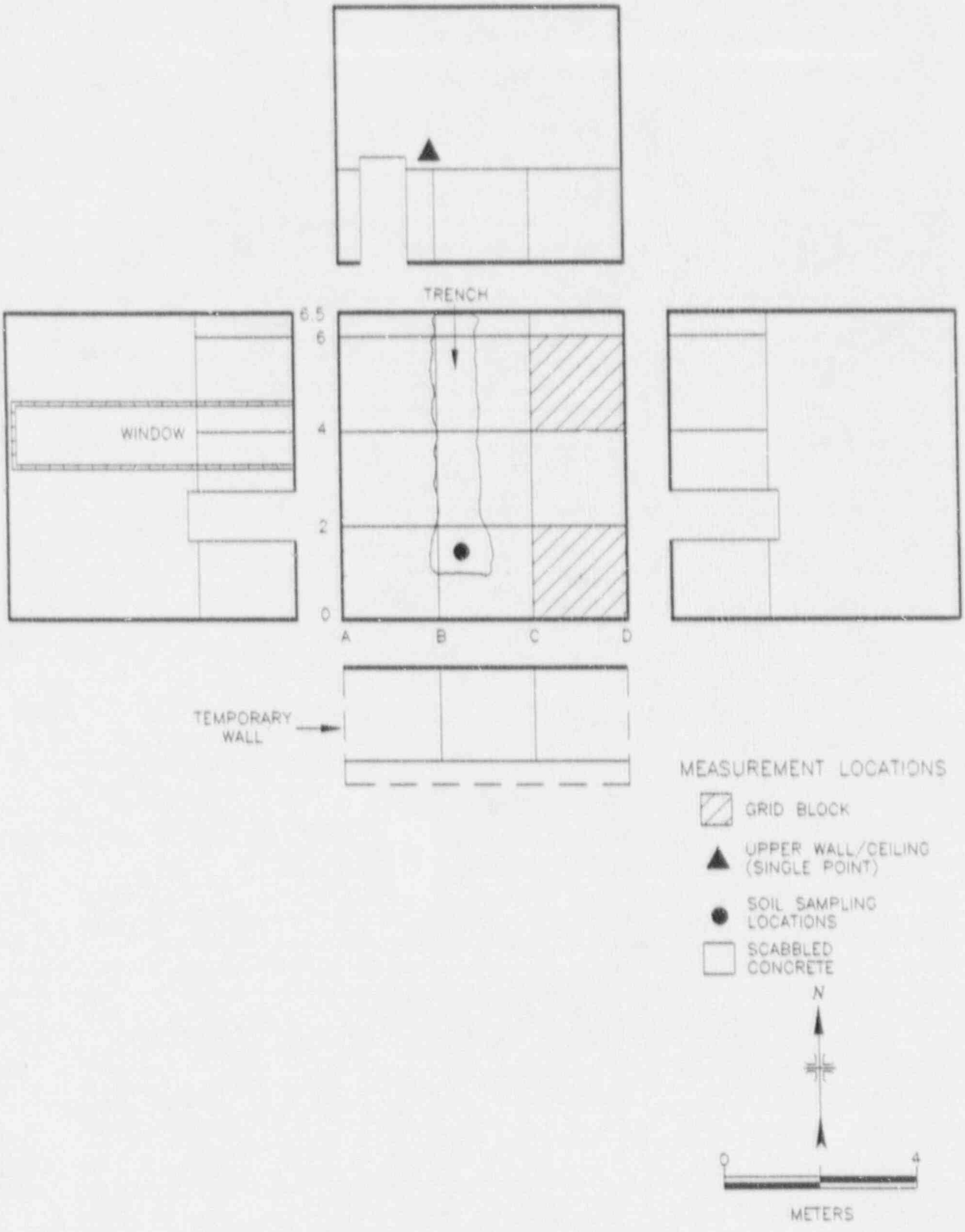

FIGURE 40: Layout of Room 49A, Indicating Locations of Soil and Surface Contamination Measurements

GAT65

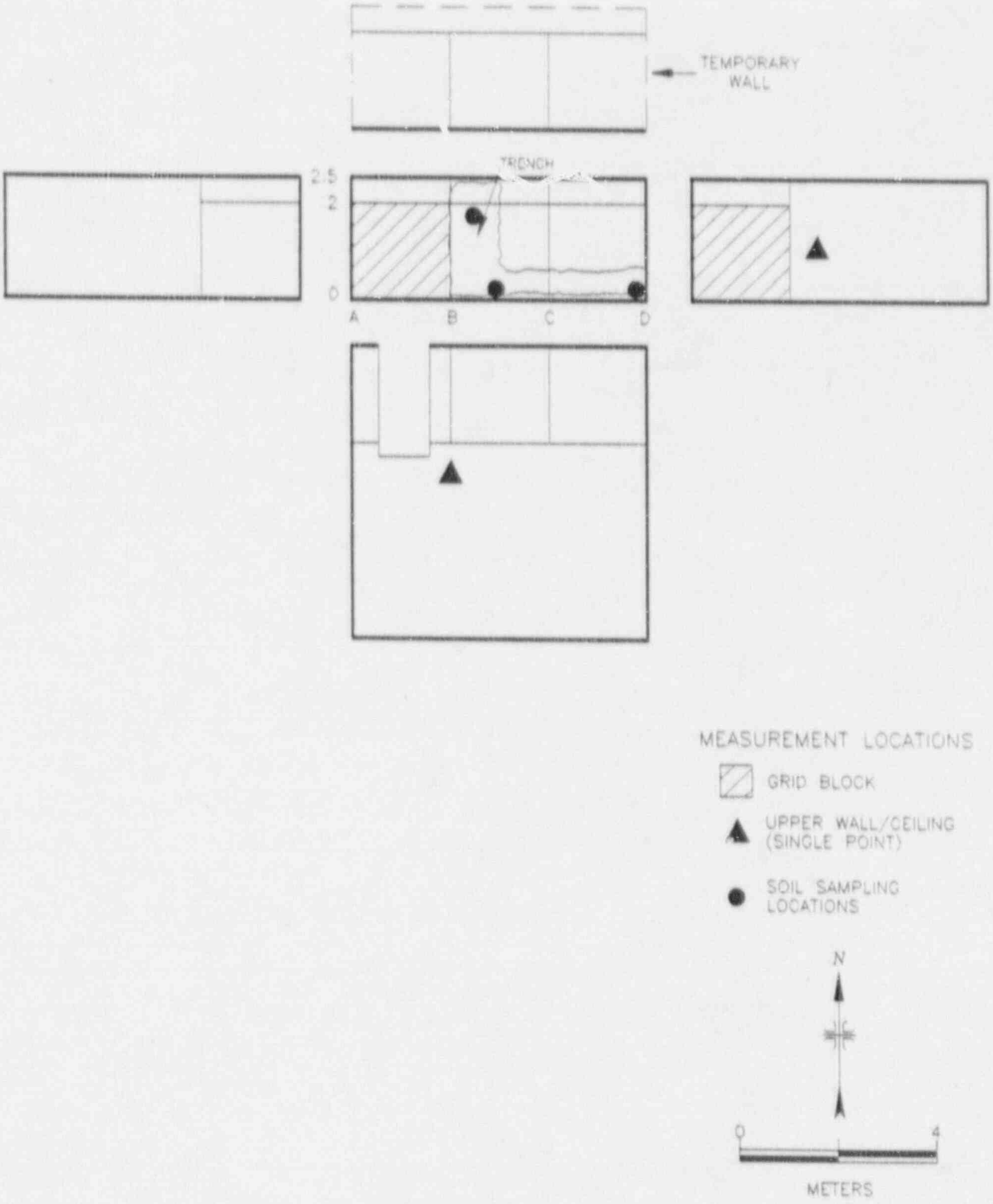

FIGURE 41: Layout of Room 50, Indicating Locations of Soil and Surface Contamination Measurements

QAT66

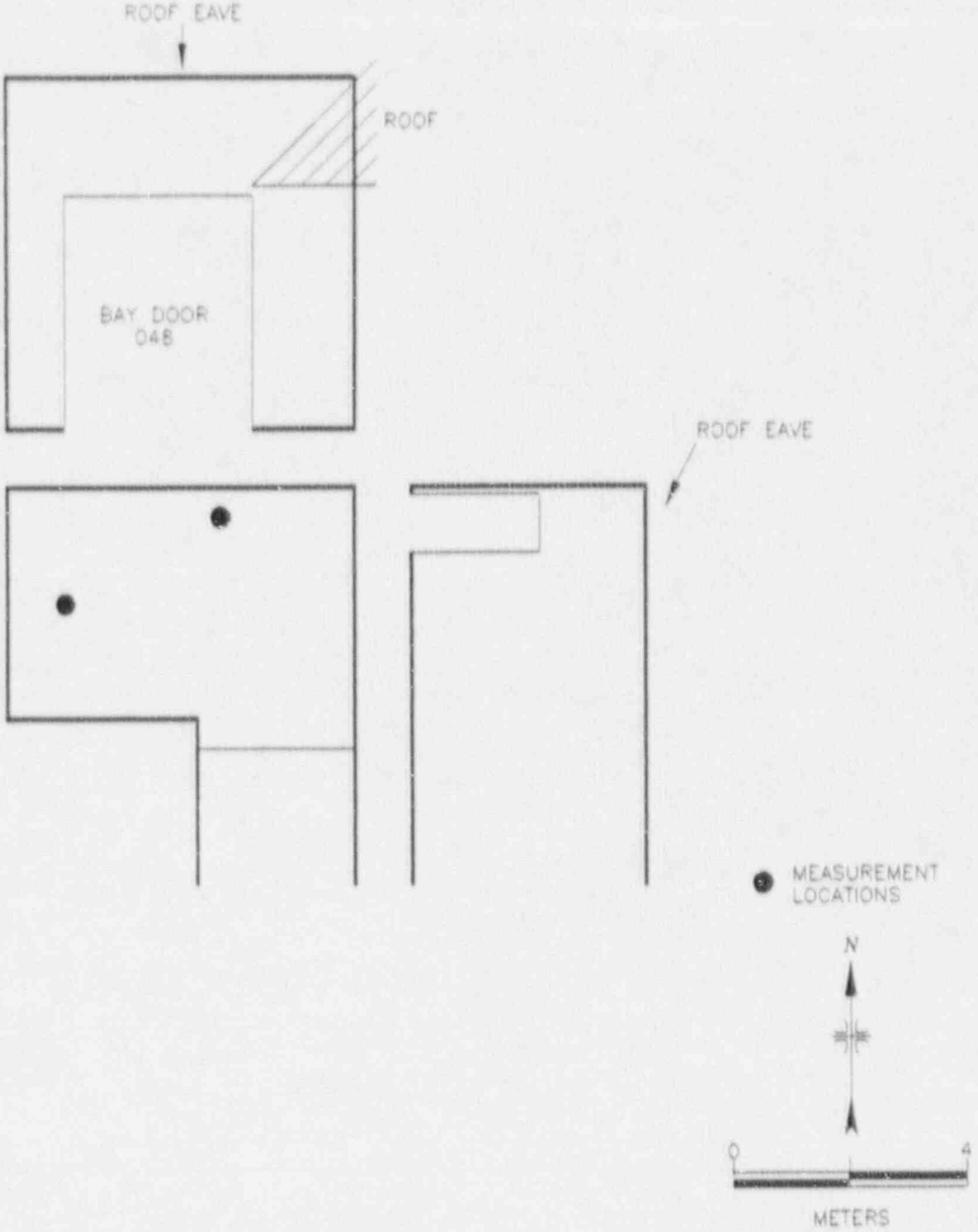

FIGURE 42: Layout of Sidewalk Area Outside Room 48, Indicating Locations of Surface Contamination Measurements

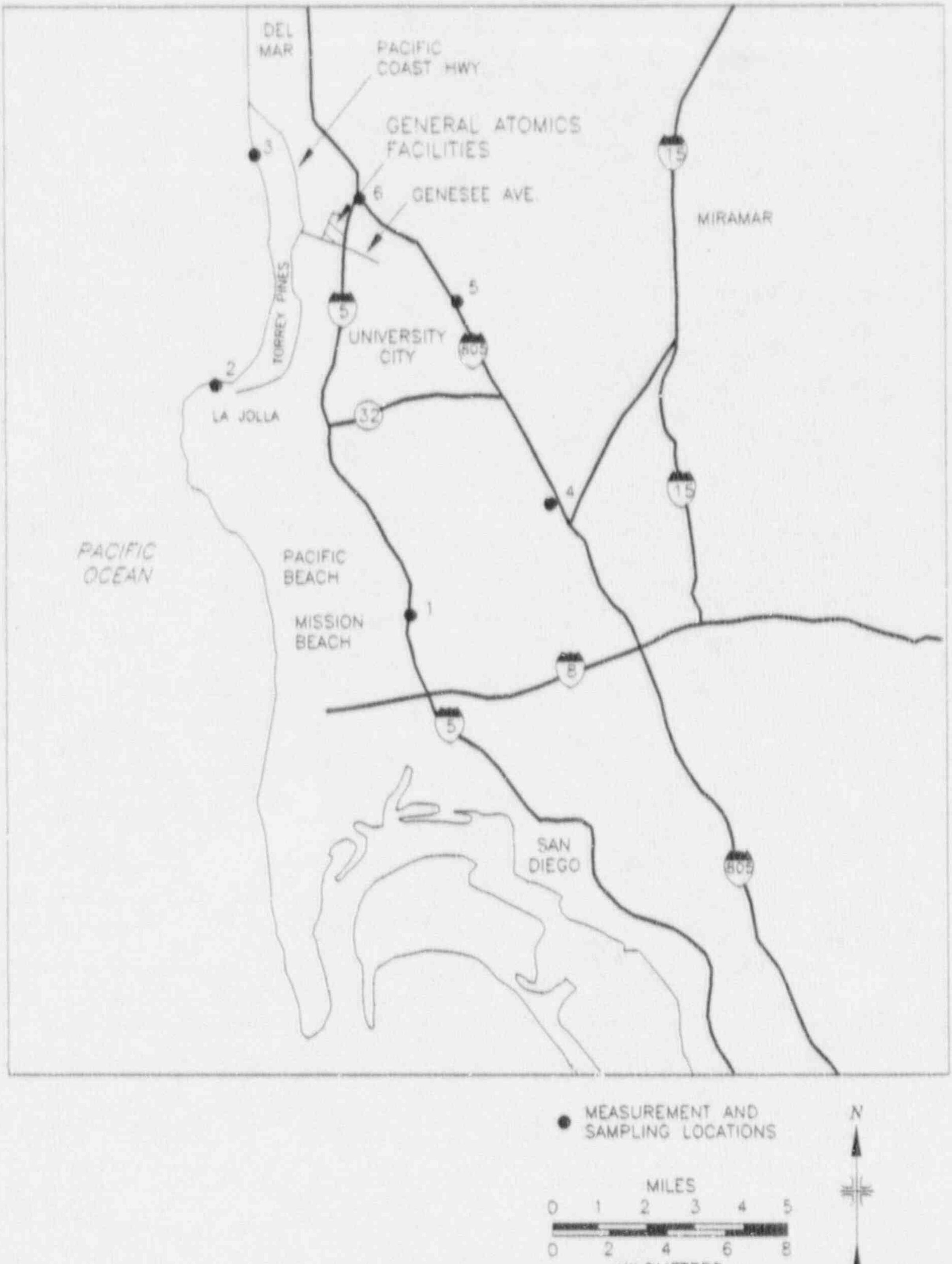

FIGURE 43: Locations of Background Measurements and Baseline Soil Samples from the Vicinity of General Atomics

TABLE 1

BACKGROUND RADIATION LEVELS
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA[a]

Location[b]	Gamma Exposure Rates at 1 m Above the Surface (μR/h)	Gamma Exposure Rates at the Surface (μR/h)
1	7	8
2	8	8
3	7	7
4	10	10
5	13	15
6	13	15
RANGE	7 to 13	7 to 15
AVERAGE	9.7	10.5

[a] Data obtained during confirmatory survey of phase I decommissioning activities(1.)

[b] Refer to Figure 43.

TABLE 2

BASELINE RADIONUCLIDE CONCENTRATIONS IN SOIL
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA[a]

Location[b]	Radionuclide Concentration (pCi/g)						
	Co-60	Cs-137	U-235	U-238	Th-228	Th-232	K-40
1	<0.1	<0.1	0.6 ± 0.1[c]	<0.2	1.6 ± 1.2	1.3 ± 0.5	14.0 ± 1.7
2	<0.1	0.2 ± 0.1	0.5 ± 0.2	<0.2	1.6 ± 1.5	2.0 ± 0.9	25.0 ± 3.3
3	<0.1	<0.1	0.7 ± 0.2	0.4 ± 0.2	1.1 ± 0.5	2.2 ± 0.6	10.4 ± 1.7
4	<0.1	<0.1	1.2 ± 0.3	<0.3	<1.1	3.1 ± 0.8	29.0 ± 3.4
5	<0.1	<0.1	0.2 ± 0.2	0.7 ± 0.6	1.3 ± 0.6	3.2 ± 0.8	24.3 ± 2.7
6	<0.1	<0.1	0.7 ± 0.2	<0.2	1.0 ± 0.9	1.9 ± 0.8	30.2 ± 2.9
RANGE	<0.1 to <0.1	<0.1 to <0.2	0.5 to 1.2	<0.2 to <0.7	1.1 to 1.6	1.3 to 3.2	0.6 to 30.2
AVERAGE	<0.1	<0.1	0.8	<0.5	1.3	2.3	22.2

---

[a] Data obtained during confirmatory survey of Phase I decommissioning activities(1.)

[b] Refer to Figure 43.

[c] Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.

TABLE 3

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or[a] Area	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average (dpm/100 cm^2)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta-Gamma Range
234	Floor	2[b]	<27	420	<27 - 38	<320 - 640	<3	<6 - 8
	Lower Wall	2[b]	<27	<320	<27 - 38	<320 - 590	<3 - 3	<6 - 7
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 85	<320 - 480	<3 - 3	<6 - 64
302	Floor	1[b]	<27	1100	<27 - 38	690 - 1400	<3	<6
	Lower Wall	-[f]	-	-	-	-	-	-
	U. Wall/Ceiling	-	-	-	-	-	-	-
309 Room 1	Floor	3[b]	<27	2700	<27	1200 - 5200	<3	<6
	Lower Wall	2[b]	47	1500	<27 - 122	910 - 1800	<3	<6
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 47	1000 - 2000	<3 - 3	<6 - 10
309 Room 2	Floor	-	-	-	-	-	-	-
	Lower Wall	6[b]	<27	1500	<24 - 85	970 - 4100	<3	<6 - 8
	U. Wall/Ceiling	1[c]	N/A	N/A	<27	1700	<3	<6
315	Floor	3[b]	<27	390	<24 - 28	<320 - 1100	<3	<6 - 9
	Lower Wall	3[b]	<27	<320	<24 - 56	<320 - 510	<3	<6 - 7
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 85	<320 - 960	<3	<6 - 10

TABLE 3 (Continued)

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or[a] Area	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average (dpm/100 cm²)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta-Gamma Range
321/323[f]	Floor	4[b]	36	1200	<27 - 66	<560 - 1700	<3	<6 - 7
	Lower Wall	4[b]	32	930	<27 - 66	<320 - 1100	<3	<6
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 38	350 - 1400	<3	<6 - 6
	Miscellaneous	1 (Drain)[c]	N/A	N/A	-	1400	<3	<6
321/323[f] Mezzanine	Floor	4[b]	N/A	N/A	<27	<320 - 960	<3	<6
	Lower Wall	4[b]	N/A	N/A	<27 - 28	<320 - 800	<3 - 3	<6 - 7
	U. Wall/Ceiling	1[c]	N/A	N/A	28	560	<3	8
	Miscellaneous	1 (Hood)[c]	N/A	N/A	<27	720	<3	<6
327	Floor	2[b]	33	530	<27 - 66	<320 - 850	<3 - 9	<6
	Lower Wall	2[b]	<27	380	<27 - 56	<320 - 830	<3	<6
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 28	<320 - 400	<3	<6
325/327[f] Mezzanine	Floor	4[c]	N/A	N/A	<27	<320	<3 - 9	<6
	Lower Wall	4[c]	N/A	N/A	<27 - 38	<320	<3	<6
	U. Wall/Ceiling	1[c]	N/A	N/A	56	370	<3 - 3	<6 - 12
	Miscellaneous	1 (Duct)[c]	N/A	N/A	<27	<320	<3	12

TABLE 3 (Continued)

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or[a] Area	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average (dpm/100 cm^2)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta-Gamma Range
335/337[f] Mezzanine	Floor	4^c	N/A	N/A	<27 - 38	<320	<3	<6
	Lower Wall	2^c	N/A	N/A	<27 - 38	<320	<3	<6
	U. Wall/Ceiling	1^c	N/A	N/A	<27	<320	<3	<6
339/341[f] Mezzanine	Floor	4^c	N/A	N/A	<27 - 28	<320 - 560	<3 - 3	<6
	Lower Wall	4^c	N/A	N/A	<27 - 28	<320 - 480	<3	<6
	U. Wall/Ceiling	2^c	N/A	N/A	<27 - 28	<320	<3	<6 - 6
343/345	Floor	4^b	30	560	<27 - 56	<320 - 770	<3	<6 - 9
	Lower Wall	3^b	<27	760	<27 - 38	<320 - 1100	<3 - 3	<6
	U. Wall/Ceiling	5^c	N/A	N/A	<27 - 66	<320 - 450	<3 - 3	<6 - 12
	Miscellaneous	1 (Duct)^c	N/A	N/A	28	<320	<3	<6
343/345[f] Mezzanine	Floor	4^c	N/A	N/A	<27 - 38	<320	<3 - 3	<6 - 9
	Lower Wall	4^c	N/A	N/A	<27 - 38	<320 - 430	<3	<6
	U. Wall/Ceiling	2^c	N/A	N/A	<27 - 38	<320	<3	<6
347	Floor	2^b	<27	460	<27 - 47	<320 - 750	<3	<6 - 7
	Lower Wall	2^b	32	630	<27 - 47	<320 - 1000	<3 - 3	<6 - 10
	U. Wall/Ceiling	4^c	N/A	N/A	<27 - 28	<320 - 770	<3	<6 - 31

TABLE 3 (Continued)

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or[a] Area	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average (dpm/100 cm^2)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta-Gamma Range
347/349[f]	Floor	4[c]	N/A	N/A	<27 - 75	<320	<3 - 3	<6
Mazzanine	Lower Wall	4[c]	N/A	N/A	<27 - 47	<320 - 770	<3 - 3	<6 - 6
	U. Wall/Ceiling	2[c]	N/A	N/A	<27	<320	<3	<6
425/427/429[f]	Floor	6[b]	43	600	<27 - 100	<320 - 850	<3 - 21	<6 - 10
	Lower Wall	7[b]	36	490	<27 - 85	<320 - 750	<3	<6 - 8
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 38	<320 - 530	<3	<6 - 8
	Miscellaneous	1 (Duct)[c]	N/A	N/A	47	<320	<3	<6
425/427/429[f]	Floor	3[c]	N/A	N/A	<25	<430	<3	<6
Mezzanine	Lower Wall	5[c]	N/A	N/A	<25 - 27	<430	<3	<6
	U. Wall/Ceiling	-	-	-	-	-	-	-
	Miscellaneous	1 (Sink)[c]	N/A	N/A	<25	<430	<3	<6
431	Floor	2[b]	<27	<320	<27 - 28	<320 - 560	<3	<6
	Lower Wall	2[b]	<27	<320	<27 - 38	<320 - 320	5	<6
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 47	<320	<3 - 5	<6
	Miscellaneous	1 (Sink)[c]	N/A	N/A	330	510	<3	<6

TABLE 3 (Continued)

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or[a] Area	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average (dpm/100 cm^2)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta-Gamma Range
433	Floor	2[b]	<27	490	<27 - 38	<320 - 640	<3	<6
	Lower Wall	2[b]	<27	700	<27 - 56	<320 - 910	<3	<6
	U. Wall/Ceiling	3[c]	N/A	N/A	<27	<320 - 670	<3	<6
	Miscellaneous	1 (Hood)	N/A	N/A	<27	<320	<3	6
431/433[f] Mezzanine	Floor	5[c]	N/A	N/A	<25 - 1500	<430 - 9000	<3 - 3	<6 - 26
	Lower Wall	3[c]	N/A	N/A	<25 - 45	<430	<3	<6
	U. Wall/Ceiling	-	-	-	-	-	-	-
615/617[f] Mezzanine	Floor	4[c]	N/A	N/A	<27 - 47	<320	<3 - 5	<6
	Lower Wall	3[c]	N/A	N/A	<27 - 28	<320	<3	<6
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 47	<320 - 450	<3	<6 - 7
647	Floor	2[b]	<27	730	<27 - 38	<320 - 880	<3	<6 - 8
	Lower Wall	2[b]	<27	540	<27 - 66	<320 - 800	<3	<6 - 6
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 190	<320 - 450	<3 - 9	<6 - 19
645/647[f] Mezzanine	Floor	4[c]	N/A	N/A	<27	<320 - 370	<3	<6 - 8
	Lower Wall	3[c]	N/A	N/A	<27 - 85	<320	<3	<6 - 6
	U. Wall/Ceiling	3[c]	N/A	N/A	56 - 75	<320	<3 - 5	<6 - 8

TABLE 3 (Continued)

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or[a] Area	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average (dpm/100 cm^2)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta-Gamma Range
649	Floor	2[b]	<27	740	<27 - 85	<320 - 960	<3	<6
	Lower Wall	2[b]	<27	370	<27 - 75	<320 - 560	<3	<6
	U. Wall/Ceiling	3[c]	N/A	N/A	<27 - 56	<320	<3 - 5	<6 - 8
	Miscellaneous	1 (Hood)[c]	N/A	N/A	<27	<320	<3	<6
651	Floor	2[b]	<27	590	<27 - 56	<320 - 670	<3 - 3	<6
	Lower Wall	2[b]	28	770	<27 - 38	<320 - 850	<3	<6
	U. Wall/Ceiling	4[c]	N/A	N/A	<27 - 66	<320 - 960	<3 - 3	<6

[a] Refer to Figures 9 to 32.

[b] Five point measurement.

[c] Single point measurement.

[d] N/A; Not Applicable.

[e] -; Measurements not performed.

[f] Rooms were gridded together.

TABLE 4

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 9, E BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or[a] Area	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average (dpm/100 cm^2)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta-Gamma Range
33	Floor	1[b]	N/A[c]	N/A	<24	430	<3	<6
	Lower Wall	1[b]	N/A	N/A	<24	<430	<3	<6
	U. Wall/Ceiling	-[d]	-	-	-	-	-	-
34	Floor	2[b]	N/A	N/A	<24	<430	<3	<6
	Lower Wall	1[b]	N/A	N/A	<24	<430	3	<6
	U. Wall/Ceiling	-	-	-	-	-	-	-
38	Floor	2[e]	45	1600	<27 - 670	<360 - 6400	<3 - 3	<6
	Lower Wall	1[e]	<27	<360	<27 - 28	<360	<3	<6
	U. Wall/Ceiling	-	-	-	-	-	-	-
39	Floor	2[e]	81	1200	<24 - 360	550 - 1700	<3	<6
	Lower Wall	-	-	-	-	-	-	-
	U. Wall/Ceiling	2[b]	N/A	N/A	36	<360 - 380	<3	<6

TABLE 4 (Continued)

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 9, E BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or Area	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average (dpm/100 cm^2)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta-Gamma Range
Main Entry Hall	Floor	2^b	N/A	N/A	<24	<430	<3	<6
	Lower Wall	-	-	-	-	-	-	-
	U. Wall/Ceiling	-	-	-	-	-	-	-
	Miscellaneous	1(Drain)^b	N/A	N/A	-	<430	<3	<6
Hallway (portion of Old Change Room)	Floor	1^b	N/A	N/A	<24	600	<3	<6
	Lower Wall	1^b	N/A	N/A	38	<430	<3	<6
	U. Wall/Ceiling	-	-	-	-	-	-	-
47A/47B	Floor	4^b	N/A	N/A	47 - 190	<320 - 990	<3 - 3	<6
	Lower Wall	2^b	N/A	N/A	<27 - 28	<320	<3	10
	U. Wall/Ceiling	-	-	-	-	-	-	-
	Miscellaneous	1 (Drain)^b	N/A	N/A	-	930	<3	<6
48	Floor	2^e	38	1700	<27 - 75	590 - 3500	3 - 5	<6
	Lower Wall	2^e	<27	<320	<27 - 47	<320 - 370	<3	<6
	U. Wall/Ceiling	4^b	N/A	N/A	<27 - 240	<320 - 9300	<3 - 36	<6 - 35

TABLE 4 (Continued)

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
BUILDING 9, E BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Room or Area	Location	# of Grid Blocks or Locations Measured	Highest Grid Block Average (dpm/100 cm^2)		TOTAL CONTAMINATION (dpm/100 cm^2)		REMOVABLE CONTAMINATION (dpm/100 cm^2)	
			Alpha	Beta	Alpha Range	Beta-Gamma Range	Alpha Range	Beta-Gamma Range
49A	Floor	2[e]	470	1900	56 - 910	1000 - 3600	<3 - 5	<6
	Lower Wall	2[e]	34	<320	<27 - 56	<320	<3 - 19	<6 - 14
	U. Wall/Ceiling	2[b]	N/A	N/A	28 - 47	<320	<3	<6
50	Floor	1[e]	290	840	<27 - 1300	530 - 1300	<3	<6
	Lower Wall	1[e]	32	<320	<27 - 66	<320	<3	<6
	U. Wall/Ceiling	2[b]	N/A	N/A	<27 - 38	<320	[illegible]	<6
Outside Sidewalk	Floor	2[b]	–	N/A	73 - 97	[illegible] - 34[illegible]	[illegible]	<6
	Lower Wall	–	–	–	–	–	[illegible]	–
	U. Wall/Ceiling	–	–	–	–	–	[illegible]	–

---

[a] Refer to Figures 33 to 42.

[b] Single point measurements.

[c] N/A; Not Applicable.

[d] –; Measurement not performed.

[e] Five point measurements.

[f] Rooms were gridded together.

TABLE 5

RADIONUCLIDE CONCENTRATIONS IN SOIL
BUILDINGS 2 AND 9
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Building/Room[a]	Location	Radionuclide Concentration (pCi/g)					
		Co-60	Cs-137	U-235	U-238	Th-228	Th-232
Building 2							
302	B, 1.5	<0.1	0.1 ± 0.1[b]	<0.3	<0.7	<0.1	2.0 ± 0.3
	Trench in Hall	0.3 ± 0.1	<0.1	<0.2	<0.8	<0.1	2.0 ± 0.3
	B, 7, Bottom of Trench Outside	<0.1	3.0 ± 0.1	<0.3	<0.6	<0.1	2.0 ± 0.2
309, Room 1	A+1, 1.8	0.8 ± 0.1	1.0 ± 0.1	<0.2	<0.7	<0.1	1.0 ± 0.3
309, Room 2	A,6 Bottom of Trench	0.1 ± 0.1	1.0 ± 0.1	<0.3	<0.7	<0.1	2.0 ± 0.3
309	A+1.5, 5.8	0.1 ± 0.1	7.0 ± 0.2	<0.3	<0.8	<0.1	1.0 ± 0.3
309[c]	B+1,1	19.0 ± 0.4	<0.1	<0.3	<1.0	<0.1	2.0 ± 0.5
309[d]	B+1,1: Small Hole	3.0 ± 0.2	1.0 ± 0.1	<0.4	2.0 ± 0.9	<0.1	2.0 ± 0.3
309[d]	B+1,1: Big Hole	0.3 ± 0.1	<0.1	<0.3	1.0 ± 1.0	<0.1	2.0 ± 0.4
309	A+1,3.2	0.1 ± 0.1	<0.1	<0.5	<0.7	<0.1	<0.4
Building 9							
49A	B+.5, 1.75, Bldg. 9 Trench	<0.1	<0.1	<0.3	0.7 ± 0.2	<0.1	1.0 ± 0.4
50	B+.5, 0, Bldg. 9 Trench	<0.1	<0.1	<0.2	<0.6	<0.1	2.0 ± 0.2
50	B+.5, 2.5, Bldg. 9 Trench	<0.1	<0.1	<0.2	2.0 ± 0.3	<0.1	2.0 ± 0.2
50	D,0	<0.1	<0.1	<0.2	3.0 ± 0.7	<0.1	2.0 ± 0.3

[a] Refer to Figures 10-12, 40 and 41.

[b] Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.

[c] Before additional remediation.

[d] After additional remediation.

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6. General Atomics. Decontamination of the "Hot suite" Area of The TRIGA Fuel Fabrication Facility Formerly Located in Building 9 For Release to Unrestricted Use, Stage 1, San Diego, California, January 27, 1989.

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APPENDIX A

MAJOR SAMPLING AND ANALYTICAL EQUIPMENT

APPENDIX A

MAJOR SAMPLING AND ANALYTICAL EQUIPMENT

The display or description of a specific product is not to be construed as an endorsement of that product or its manufacturer by the authors or their employer.

A. Direct Radiation Measurements

Eberline "RASCAL"
Portable Ratemeter-Scaler
Model PRS-1
(Eberline, Santa Fe, NM)

Eberline PRM-6
Portable Ratemeter
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum, Sweetwater, TX)

Eberline Alpha Scintillation Probe
Model AC-3-7
(Eberline, Santa Fe, NM)

Eberline GM Pancake Probe
Model HP-260
(Eberline, Santa Fe, NM)

Victoreen Beta-Gamma "Pancake" Detector
Model 489-110
(Victoreen, Cleveland, OH)

Victoreen NaI Scintillation Detector
Model 489-55
(Victoreen, Cleveland, OH)

B. Laboratory Analyses

Automatic low-background Alpha-Beta Counter
Model LB5110-2080
(Tennelec, Inc., Oak Ridge, TN)

High-Purity Germanium Detector
Model GMX-23195-S, 23% efficiency
(EG&G ORTEC, Oak Ridge, TN)

Used in conjunction with:
Lead Shield, [illegible]-16
(Gamma Products, Inc., Palos Hills, IL)

High Purity Germanium Coaxial Well Detector
Model GWL-1102010-PWS-S, 23% efficiency
(EG&G ORTEC, Oak Ridge, TN)

Used in conjunction with:
Lead Shield Model G-16
(Applied Physical Technology, Atlanta, GA)

High Purity Germanium Detector
Model IGC25, 25% efficiency
(Princeton Gamma-Tech, Princeton, NJ)

Used in conjunction with:
Lead Shield
(Nuclear Data, Schaumburg, IL)

Multichannel Analyzer
ND-66/ND-680 System
(Nuclear Data Inc., Schaumburg, IL)

APPENDIX B

MEASUREMENT AND ANALYTICAL PROCEDURES

APPENDIX B

Measurement and Analytical Procedures

Surface Scans

Surface scans in the facility were performed by passing the probes slowly over the surface. The distance between the probes and the surface was maintained at a minimum - normally about 1 cm. Identification of elevated levels was based on increases in the audible signal from the recording or indicating instrument. Alpha and beta-gamma scans of large surface areas on the floor of the facility were accomplished by use of a gas proportional floor monitor, with a 600 cm^2 sensitive area. The instrument was slowly moved in a systematic pattern to cover 100% of the accessible area. Combinations of detectors and instrument for the scans were:

Beta-Gamma	- Pancake G-M Probe with PRM-6 ratemeter.
Beta-Gamma	- Pancake G-M Probe with PRS-1 scaler/ratemeter.
Gamma	- NaI scintillation detector (3.2 cm x 3.8 cm crystal) with PRM-6 ratemeter.
Alpha	- ZnS Probe with PRS-1 scaler/ratemeter.
Alpha-Beta	- Gas proportional floor monitor with Ludlum Model 2220 scaler/ratemeter.

Alpha and Beta-Gamma Surface Contamination Measurements

Measurements of total alpha radiation level were performed using Eberline Model PRS-1 portable scaler/ratemeters with Model AC-3-7 alpha scintillation probes. Measurements of total beta-gamma radiation levels were performed using Eberline Model PRS-1 portable scaler/ratemeters with Model HP-260 thin-window "pancake" G-M probes. Count rates (cpm) were converted to disintegration rates (dpm/100 cm^2) by dividing the net rate by the 4π efficiency and correcting of the active area of the detector. Effective window areas were 59 cm^2 for the ZnS detectors and 15 cm^2 for the G-M detectors. The background count rate for ZnS alpha probes averaged approximately 2 cpm; the average background count rate was approximately 40 cpm for the G-M detectors.

Removable Contamination Measurements

Smear measurements were performed on numbered filter paper disks, 47 mm in diameter. Smears were placed in labeled envelopes with the locations and other pertinent information recorded. Smears were counted on a low-background gas-proportional counter.

Exposure Rate Measurements

Measurements of gamma exposure rates were performed using Eberline PRM-6 portable ratemeters with a Victoreen Model 489-55 gamma scintillation probe containing 3.2 cm x 3.8 cm NI(Tl) scintillation crystal. Count rates were converted to exposure rates (μR/h) by cross-calibrating with a Reuter Stokes model RSS-111 pressurized ionization chamber.

Soil Sample Analysis

Soil samples were dried, mixed, and a portion sealed in 0.5-liter Marinelli beaker. The quantity placed in the beaker was chosen to reproduce the calibrated counting geometry and typically ranged from 600 to 800 g of soil. Net soil weights were determined and the samples counted using intrinsic germanium detectors coupled to a Nuclear Data Model ND-680 pulse height analyzer system. Background and Compton stripping, peak search, peak identification, and concentration calculations were performed using the computer capabilities inherent in the analyzer system. Energy peaks used for determination of radionuclides of concern were:

Co-60	1.173 MeV
Cs-137	0.662 MeV
U-235	0.144 MeV
U-238	0.094 MeV from Th-234 (secular equilibrium assumed)
Th-232	0.911 MeV from Ac-228 (secular equilibrium assumed)

Spectra were also reviewed for the presence of other radionuclides.

Uncertainties and Detection Limits

The uncertainties associated with the analytical data presented in the tables of this report, represent the 95% confidence levels for that data. These uncertainties were calculated based on both the gross sample count levels and the associated background count levels. When the net sample count was less than the 95% statistical deviation of the background count, the sample concentration was reported as less than the detection limits of the procedure. Because of variations in background levels, sample weights or volumes, and Compton contributions from other radionuclides in samples, the detection limits differ from sample to sample and instrument to instrument. Additional uncertainties of ± 6 to 10%, associated with sampling and laboratory procedures, have not been propagated into the data presented in this report.

Calibration and Quality Assurance

Laboratory and field survey procedures are documented in manuals developed specifically for the Oak Ridge Associated Universities' Environmental Survey and Site Assessment Program.

With the exception of the measurements conducted with portable gamma scintillation survey meters, instruments were calibrated with NBS-traceable standards. The calibration procedures for the portable gamma instruments are performed by comparison with an NBS calibrated pressurized ionization chamber.

Quality control procedures on all instruments included daily background and check-source measurements to confirm equipment operation within acceptable statistical fluctuations. The ORAU laboratory participates in the EPA and EML Quality Assurance Programs.

APPENDIX C

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BY-PRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIAL

APPENDIX C

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE, OR SPECIAL NUCLEAR MATERIAL

U.S. Nuclear Regulatory Commission
Divison of Fuel Cycle & Material Safety
Washington, D.C.   20555

July 1982

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces or premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer of premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

   a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

   b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of

the survey report shall be filed with the Division of Fuel Cycle and Material Safety, USNRC, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

a. Identify the premises.

b. Show that reasonable effort has been made to eliminate residual contamination.

c. Describe the scope of the survey and general procedures followed.

d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223 Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] the maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

ADDITIONAL

DECOMMISSIONING GUIDELINES FOR THE GENERAL ATOMICS FACILITY

Target criteria for unrestricted release of the General Atomics Waste Processing Facility and surrounding areas are presented in the licensee's final report and are as follows:

External Radiation

The gamma exposure rate at 1 m above the ground surface shall not exceed 10 μR/h above background for an area of greater than 30 ft (9.1 m) x 30 ft (9.1 m) and shall not exceed 20 μR/h above background for any discrete area [i.e. less than 30 ft (9.1 m) x 30 ft (9.1 m)].

Inhalation and Ingestion

Concentrations of radionuclides in soil shall be such that inhalation and ingestion are not expected to result in annual dose equivalents exceeding 20 mrem to the lung or 60 mrem to the bone.

Limiting soil concentrations are derived to satisfy these external and internal target criteria. The concentration limits are presented in the following Table.

Radionuclide	Concentration Limit Above Background (pCi/g)
Depleted Uranium	35
Enriched Uranium	30
Thorium (Natural)	10
Co-60	8
Cs-137	15
Sr-90	1.8×10^3

Where more than one radionuclide is present, the sum of the ratios of the individual radionuclide concentrations to their respective concentrations limits shall not exceed 1.

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Nuclear Safety

CONFIRMATORY SURVEY OF BUILDING 2, GROUP 4 LABORATORIES AND BUILDING 9, STAGE 2 ROOMS GENERAL ATOMICS SAN DIEGO, CALIFORNIA

P. R. COTTEN

Environmental Survey and Site Assessment Program
Energy/Environment Systems Division

FINAL REPORT
JANUARY 1990

CONFIRMATORY SURVEY
OF
BUILDING 2, GROUP 4 LABORATORIES
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SAN DIEGO, CALIFORNIA

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Region V Office

FINAL REPORT

JANUARY 1990

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AND
BUILDING 9, STAGE 2 ROOMS
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

INTRODUCTION AND SITE HISTORY

In mid 1984, General Atomics of San Diego, California, initiated decommissioning activities for the purpose of releasing portions of their facilities from Nuclear Regulatory Commission (NRC) licensing restrictions. Decommissioning activities are initiated as land and laboratory facilities are no longer needed for research and development by General Atomics (GA). Decommissioning at the GA facility is being conducted in several phases. Phase I activities included the Solar Evaporation Pond, the areas immediately surrounding the former Waste Processing Facility, the area adjacent to the Incinerator Pad, the hillside and canyon below the waste processing facilities, and the undeveloped land surrounding the waste processing facilities; Phase II was the former Waste Processing Facility and the Incinerator Pad; Phase III consisted of approximately 87 hectares of undeveloped land, surrounding the main GA plant facilities, and the shipping and receiving area of Building 5; and Phase IV included three canyons behind the Hot Cell and TRIGA facilities, a former sewage treatment plant known as "Callan Ponds," and 12 laboratories in Building 2 of the L Building Complex. Phase I, II, III, and IV areas were previously remediated and confirmatory surveys performed by Oak Ridge Associated Universities (ORAU). Surveys results of Phase I, II, III, and IV are presented in separate reports.(1-4) Building 2 (E Building Complex) laboratories and offices, included in Phase IV decommissioning were designated as "Group 1" and "Group 2" facilities. In early 1989, GA decontaminated "Group 3" facilities which consisted of 19 laboratories, 12 of which have mezzanine areas, and 10 separate mezzanine areas in Building 2, and the "Stage 1" area in Building 9, consisting of 9 rooms in the former TRIGA fuel fabrication "Hot Suite" facility. A total of 1172 m^2 were decontaminated and a confirmatory survey was conducted by ORAU; survey results are available in a separate report.[5]

GA has completed decontamination of "Group 4" laboratories in Building 2. "Group 4" occupies approximately 323 m^2 of floor space and consists of 11 laboratories and 3 mezzanines. "Stage 2" decontamination of the former TRIGA "Hot Suite" in Building 9 includes, Rooms 40 and 41 and occupies a total area of 52 m^2. The primary radionuclides used in Building 2 facilities were Co-60, H-3, thorium, uranium (natural, depleted, and enriched), Cs-137, and other fission products. In Building 9, uranium with U-235 enrichments, varying from 3 to 10%, was used.

At the request of the NRC, Region V Office, the Environmental Survey and Site Assessment Program of Oak Ridge Associated Universities conducted a confirmatory survey of "Group 4" rooms in Building 2 and "Stage 2" rooms in Building 9 for the purpose of determining if these facilities meet the NRC guidelines for release to unrestricted use. The survey was performed October 9-12, 1989, in accordance with a survey plan submitted to the Region V Office of the NRC. Procedures and results of this survey are presented in this report.

SITE DESCRIPTION

The GA facilities are located near the intersection of Interstate 5 and Genesee Road, approximately 20 km north of San Diego, CA (Figures 1 and 2). Figures 3 and 4 illustrate the floor plans for Buildings 2 and 9.

Building 2, a two-story, semicircle building, located in the center of the GA complex, consists of office and laboratory space divided into three sections (A,B, and C). Three laboratories have mezzanine areas which were often used for additional office or laboratory space. Locations of the "Group 4" laboratories and mezzanines within the Building 2 Complex are illustrated in Figures 5 and 6.

Building 9, located to the west of Building 2, is a large two-story structure with total floor area of 5541 m^2. GA utilized an area approximately 375 m^2 in the northwest portion of Building 9 to perform fuel fabrication. The TRIGA Fuel Fabrication "Hot Suite" operated in this location until operations were relocated in the late 1970s. Several areas of the building, including areas in the former "Hot Suite", are currently leased to different companies; GA maintains the facilities telecommunications center in former "Hot Suite" rooms. "Stage 2" decontamination consist of Rooms 40 and 41 (formerly Rooms 40, 41, 42, 43 and 47), occupying an area approximately 55 m^2 (Figure 7).

PROCEDURES

Objectives

The objectives of the survey were to confirm that the surveys, sampling, analyses, and supporting documentation provide an accurate and complete description of the radiological condition of the "Group 4" and "Stage 2" areas in Buildings 2 and 9 and, thereby, confirm that decontamination efforts were effective in meeting the NRC guidelines, relative to release of the facilities to unrestricted use.

Document Review

As part of ORAU's confirmatory activities, the survey reports prepared by GA for "Group 4" and "Stage 2" decontamination were reviewed by ORAU.(6-7) Data and survey results presented in these reports were compared to the established release guidelines.

Facility Survey

The following "Group 4" laboratories areas were surveyed in Section A of Building 2: Rooms 554/556, 558, 560, and 562/564; and in Section B, Rooms 317, 355/357, 359/361, the mezzanines of 317 and 359/361. In the "Hot Suite" of Building 9, Rooms 40 and 41 were surveyed. Figures 8 to 18 illustrate the floor plan for each room surveyed.

Gridding

An alphanumeric 2 m x 2 m reference grid system was established on the floor and lower walls (up to 2 m) for each room and mezzanine surveyed. Measurements made on upper walls, ceilings, or equipment were referenced to the grid or prominent building features.

Surface Scans

Surface scans were performed on the floor and lower walls for evidence of residual activity. Gamma scans were performed using a NaI(Tl) gamma scintillation detector and beta-gamma scans were performed using a thin window GM detector. A large area gas proportional detector was used to scan the floors for alpha and beta-gamma activity. Each detector was connected to a countrate meter with audible signal outputs. Scans of upper wall, ceilings, and overhead areas such as ledges, beams, piping, fixtures, counter tops, equipment, and ducts were performed using portable ZnS alpha scintillation and GM detectors. Areas of elevated radiation levels were identified for further investigation.

Exposure Rate Measurement

Gamma exposure rates were determined in Buildings 2 and 9, based on gamma scan data and cross-calibration with a pressurized ionization chamber.

Measurement of Surface Activity

Surface measurements on the floor and lower walls were performed in randomly selected grid blocks in Building 2 and Building 9. Measurements for total alpha and beta-gamma activity levels were systematically performed at the center and four points, midway between the center and block corners. Smears for removable activity were performed at the locations in each grid block where the highest direct reading was obtained.

Single point measurements for total and removable alpha and beta-gamma activity were performed on upper walls, overhead surfaces where dust might accumulate (i.e. ledges, ceilings, beams, pipes, and ducts), drains, counter tops and on miscellaneous equipment. Surface measurement locations are illustrated in Figures 8 through 18.

Miscellaneous Samples

Two residue samples were collected from drainlines in Rooms 317 and 355/357 of Building 2 (Figures 8 and 10). A large area swipe was used to collect residue from a vent pipe located in Building 9 Room 40, at grid location A, 7.5 (Figure 17).

Background Measurements

Background exposure rate measurements were performed to determine area background levels for comparison purposes. Locations of the background measurements are shown on Figure 19.

Sample Analyses and Interpretation of Results

Samples and direct measurement data were returned to ORAU's laboratory facility in Oak Ridge, Tennessee, for analysis and interpretation. Residue samples were analyzed by gamma spectrometry and the spectra reviewed for the major radionuclides of interest, Co-60, Cs-137, U-235, U-238, and Th-232. Spectra was also reviewed for the presence of other identifiable photopeaks. Smears were analyzed for gross alpha and beta and H-3. Additional information concerning major instrumentation, sampling equipment, and analytical procedures is provided in Appendices A and B. Survey and analysis results are compared to the NRC guidelines established for decommissioning portions of the General Atomics facility (Appendix C).

FINDINGS AND RESULTS

Document Review

A review of the final report of documentation by GA adequately summarizes the radiological status of the two facilities. Procedures and instrumentation used by GA are consistent with current industry accepted practices. GA has demonstrated that decontamination efforts were successful in meeting the established guidelines.

Background Levels

Background exposure rates from the vicinity of the GA facility are presented in Table 1. Exposures rates ranged from 7 μR/h to 13 μR/h, at 1 m from the surface. These levels are typical of exposure rates normally occurring in the environment.

Facility Survey

Exposure rates ranged from 11 μR/h to 18 μR/h in Building 2 and 9 μR/h to 11 μR/h in Building 9. These levels are below the 10 μR/h above background NRC guideline for external gamma radiation.

Building 2

Surface scans of the facilities in Building 2 did not identify any residual activity exceeding the established guidelines. Five point measurements for total and removable activity were performed in 58 gridblocks on the floor and lower walls. The results have been summarized in Table 2. The highest average activity in a gridblock for alpha was 150 dpm/100 cm^2 and for beta, 1400 dpm/100 cm^2. Total activity measurements range from <25 dpm/100cm^2 to 980 dpm/100 cm^2 for alpha activity and from <410 dpm/100 cm^2 to 1800 dpm/100 cm^2 for beta-gamma activity. For the most part, the values indicate activity levels were below the detection sensitivities of the procedure. Removable activity ranged from <3 dpm/100 dpm/100 cm^2 to 21 dpm/100 cm^2 for alpha and ranged from <6 dpm/100 cm^2 to 18 dpm/100 cm^2 for beta-gamma.

A total of 54 single-point direct measurements were collected from various surfaces in Building 2; the results have been summarized in Table 2. Total alpha activity ranged from <25 dpm/100 cm^2 to 980 dpm/100 cm^2 and total beta-gamma activity ranged from <410 dpm/100 cm^2 to 5000 dpm/100 cm^2. Removable alpha and beta-gamma activity levels ranged from <3 dpm/100 cm^2 to 7 dpm/100 cm^2 and <6 dpm/100 cm^2 to 9 dpm/100 cm^2, respectively.

A total of 115 smears collected from "Group 4" rooms were analyzed for H-3. The maximum activity determined was < 70 dpm/100 cm^2.

Radionuclide concentrations in residue samples have been summarized in Table 3. The residue collected from Room 355/357 contained 122 pCi/g of U-238. The licensee was informed of the findings by telephone and responded by removing all remaining residues from all drains in 355/357 and in 317. The State of California Department of Health Services, Radiological Health Branch, performed a follow-up survey of the drains. Several smears and a sewage effluent sample were collected. No residual activity was detected (Appendix E).

Building 9

Surface scans in Rooms 40 and 41 of Building 9, did not identify any significantly elevated activity. Only the west wall of Room 40 was included in the scan. It was the only permanent wall of the two rooms. Five gridblocks on the floor and lower wall were randomly selected for surface activity measurements. The results have been tabulated in Table 4. The highest gridblock average for alpha activity was 430 dpm/100 cm^2 and for beta-gamma activity was 990 dpm/100 cm^2. No removable activity was detected on any smears.

Three single-point locations in Rooms 40 and 41 were selected for direct measurements. Total activity ranged from <25 dpm/100 cm^2 to 1200 dpm/100 cm^2

for alpha and ranged from <410 dpm/100 cm^2 to 2300 dpm/100 cm^2 for beta-gamma. Removable activity was negligible.

A thin window GM probe was used to scan the large area swipe containing residue from the vent pipe in Room 40; no elevated activity was detected.

COMPARISON OF SURVEY RESULTS WITH GUIDELINES

Guidelines for decommissioning the GA facilities allow an exposure rate of 10 μR/h, above background at 1 m above the surface. All measurements satisfy the established guideline.

NRC surface contamination guidelines for release of facilities for unrestricted use are presented in Appendix C. The guidelines for residual activity containing uranium, and its daughter products and for mixed fission products for comparison are:

5000 dpm/100 cm^2, averaged over 1 m^2 area
15000 dpm/100 cm^2, maximum in a 100 cm^2 area
1000 dpm/100 cm^2, removable

Guidelines for residual tritium activity are:

20,000 dpm/100 cm^2, averaged over 1 m^2 area
60,000 dpm/100 cm^2, maximum in a 100 cm^2 area
4,000 dpm/100 cm^2, removable

Surface measurements for total alpha and beta-gamma activity in Building 2 and Building 9, did not exceed the established guideline values for uranium. Tritium activity was well below the guideline values. Removable alpha and beta activity was negligible on all smears. For the most part, measurements were below the detection limitations of the procedures.

SUMMARY

At the request of the NRC Region V Office, in October 1989 the Environmental Survey and Site Assessment Program of ORAU performed confirmatory surveys of Building 2 "Group 4" rooms and of "Stage 2" rooms in Building 9. The survey consisted of alpha, beta-gamma, and gamma scans of the floor and wall surfaces, exposure rate measurements, direct measurements for total and removable activity, and analysis of drain residue samples. No significant fixed or removable surface activity was detected. Elevated levels of U-235 and U-238 were measured in the drain samples collected from Rooms 317 and 355/357. The licensee responded by removing all remaining residue from the drains, and a follow-up survey by the State of California, Department of Health Services Radiological Health Branch confirmed the effectiveness of the additional cleanup. Based on the survey findings, it is ORAU's opinion that the "Group 4" and "Stage 2" rooms in Building 2 and 9, respectively, meet the guidelines established by NRC for release to unrestricted use.

GAT4

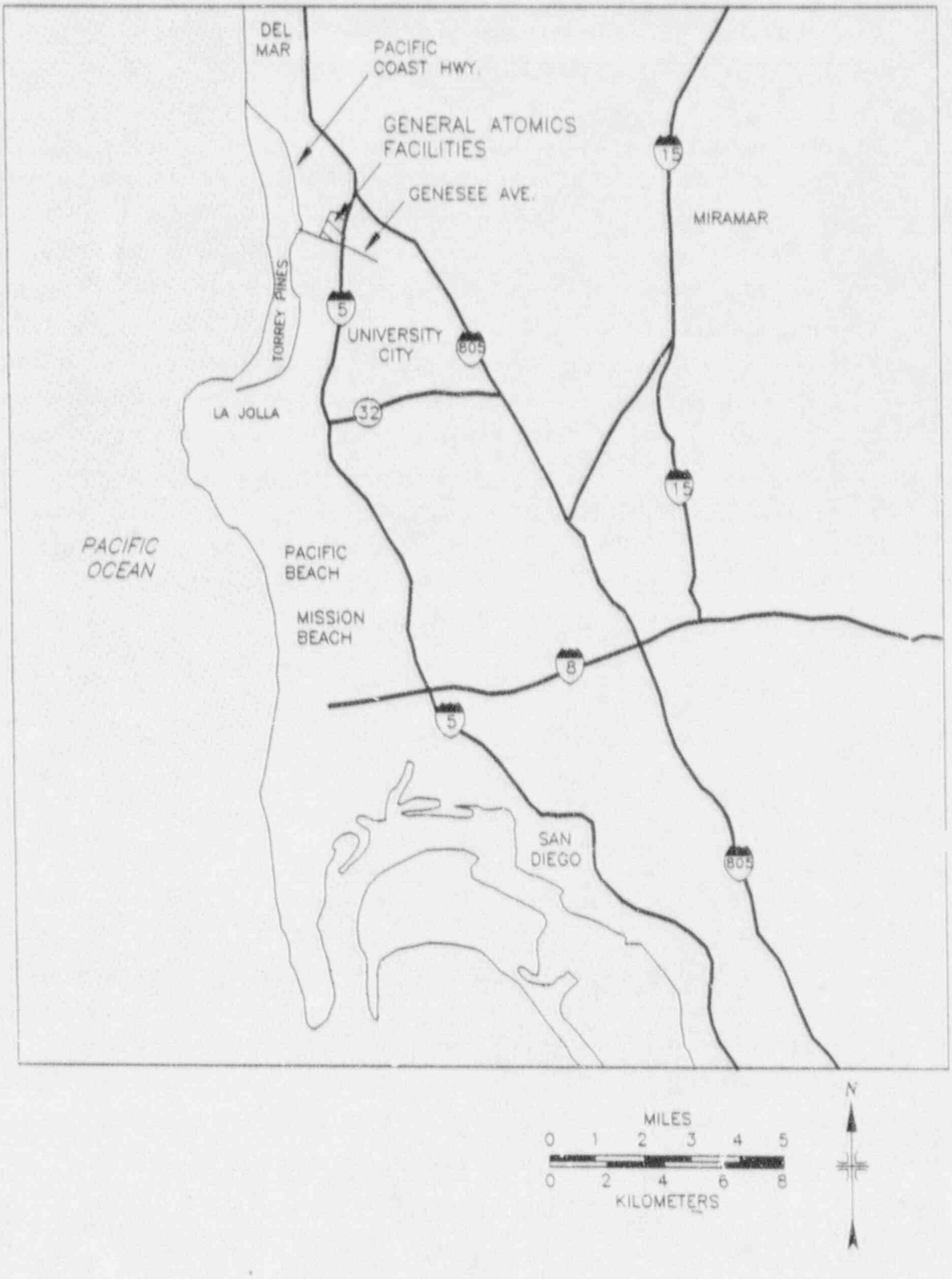
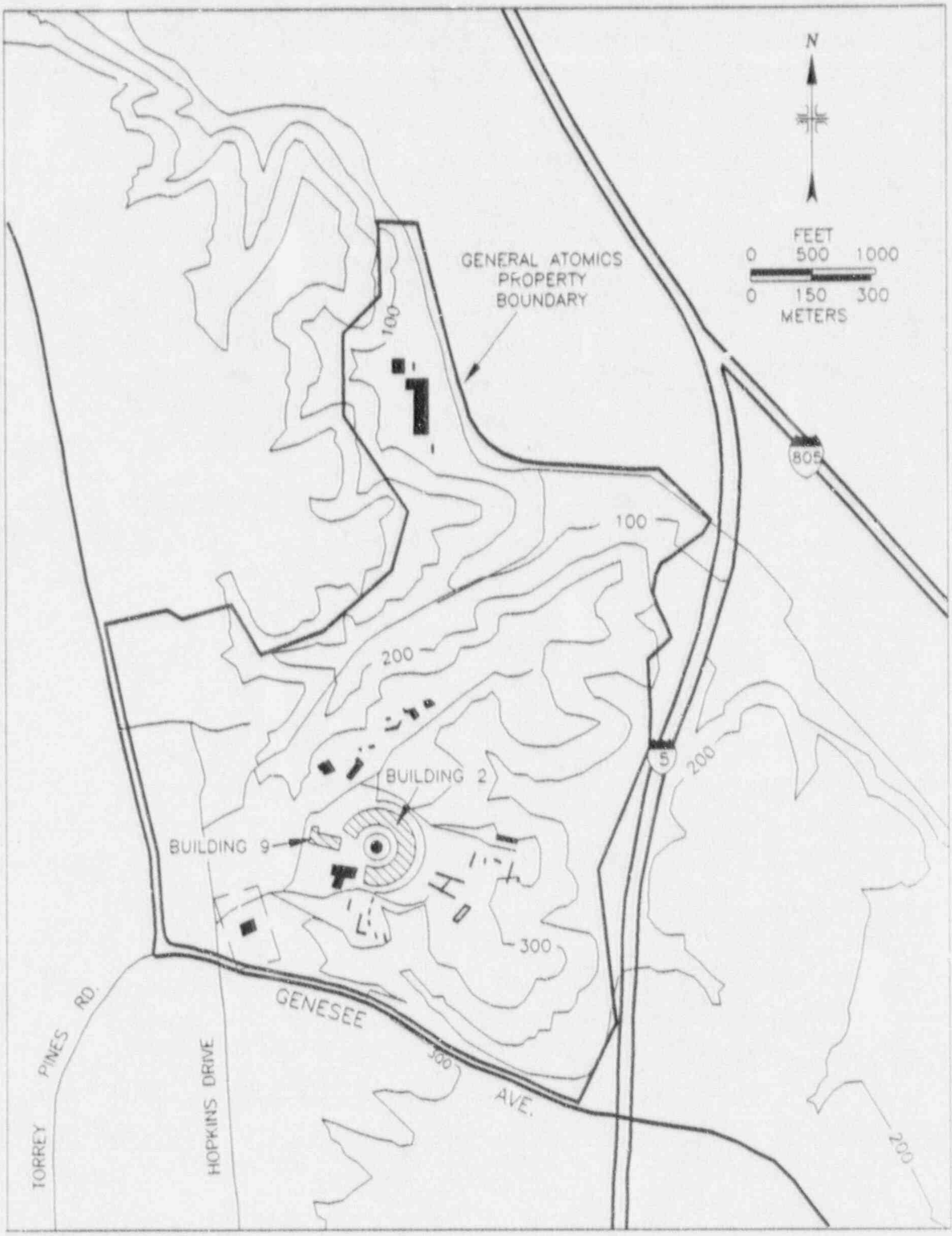


FIGURE 1: Map of the San Diego Area, Indicating the Location of General Atomics Facilities



——— 100 FOOT ELEVATION CONTOURS (RELATIVE TO SEA LEVEL)

FIGURE 2: General Atomics Plant Layout

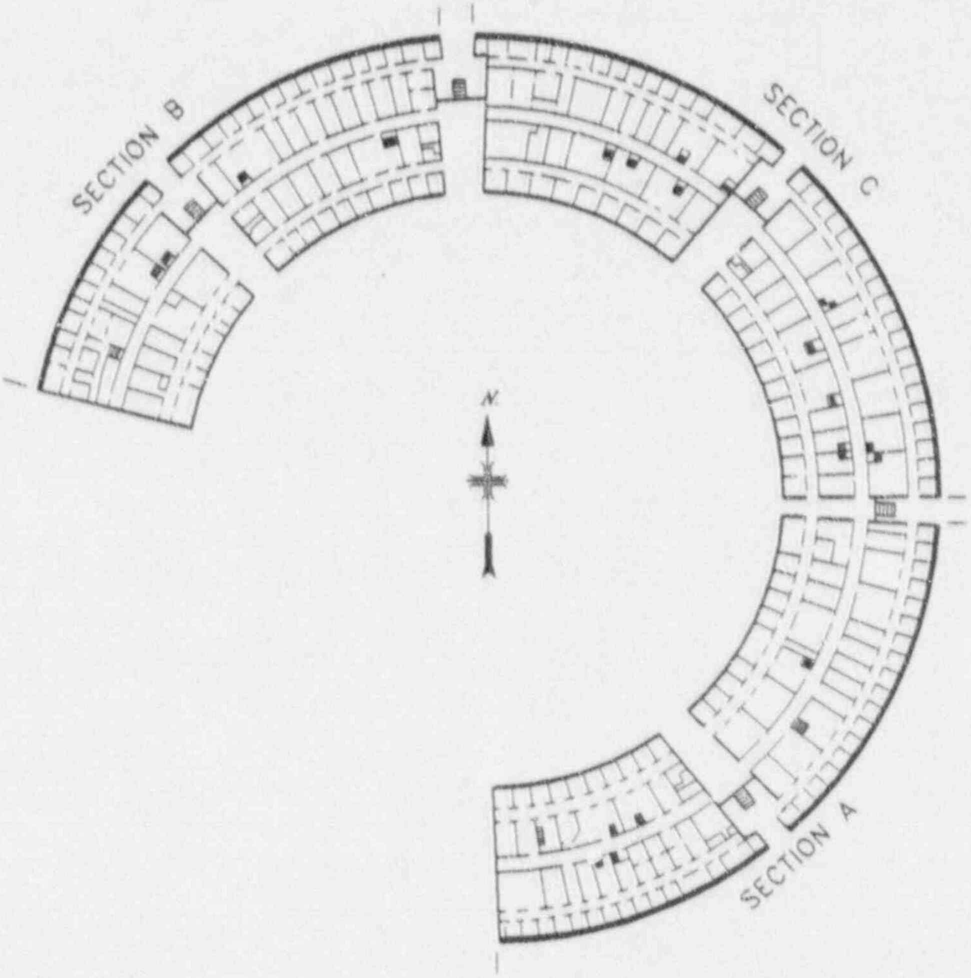


FIGURE 3: Layout of Building 2 (L Building Complex)

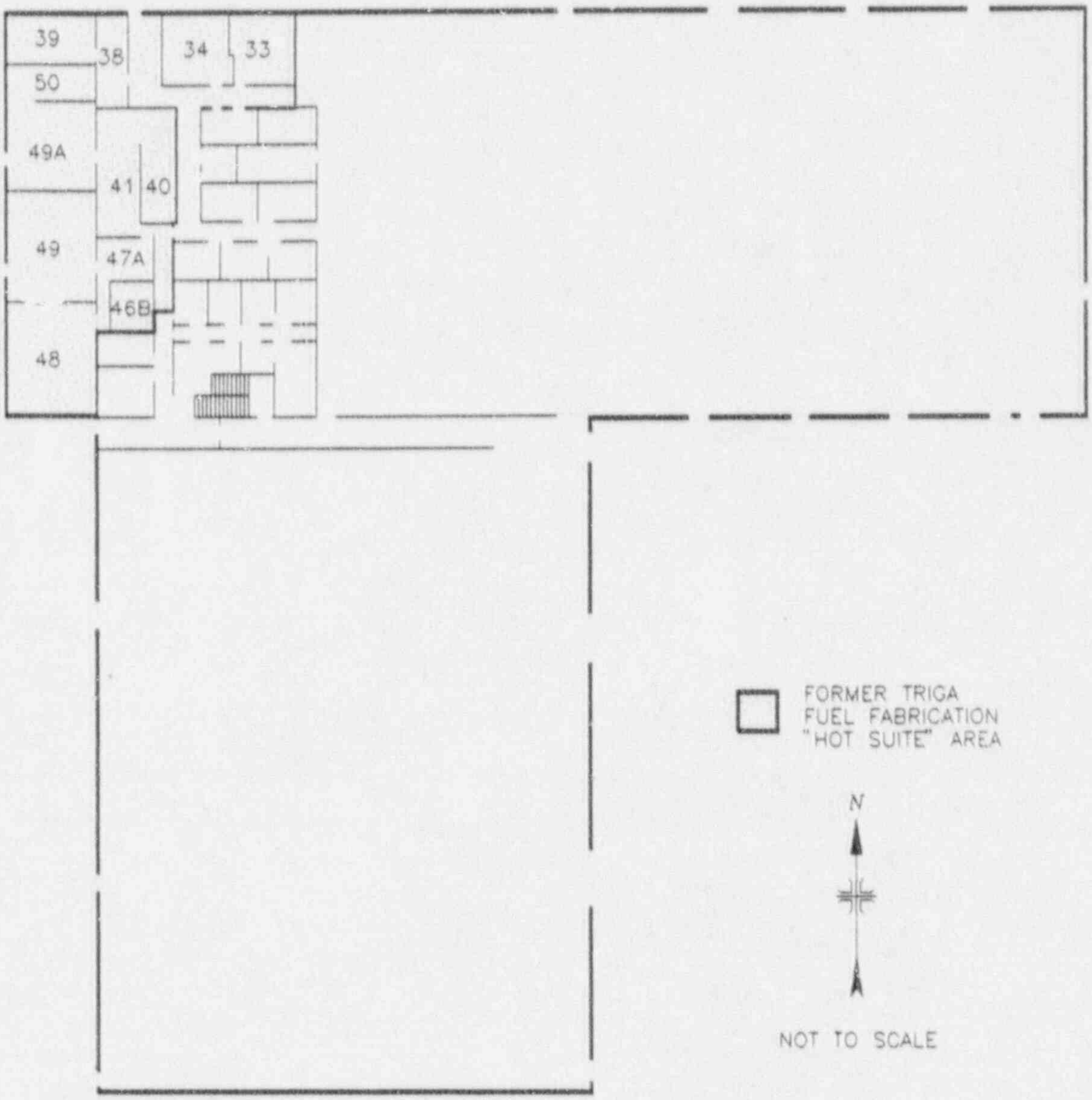


FIGURE 4: First Floor of Building 9 Indicating the Former Location of the TRIGA Fuel Fabrication "Hot Suite" Area

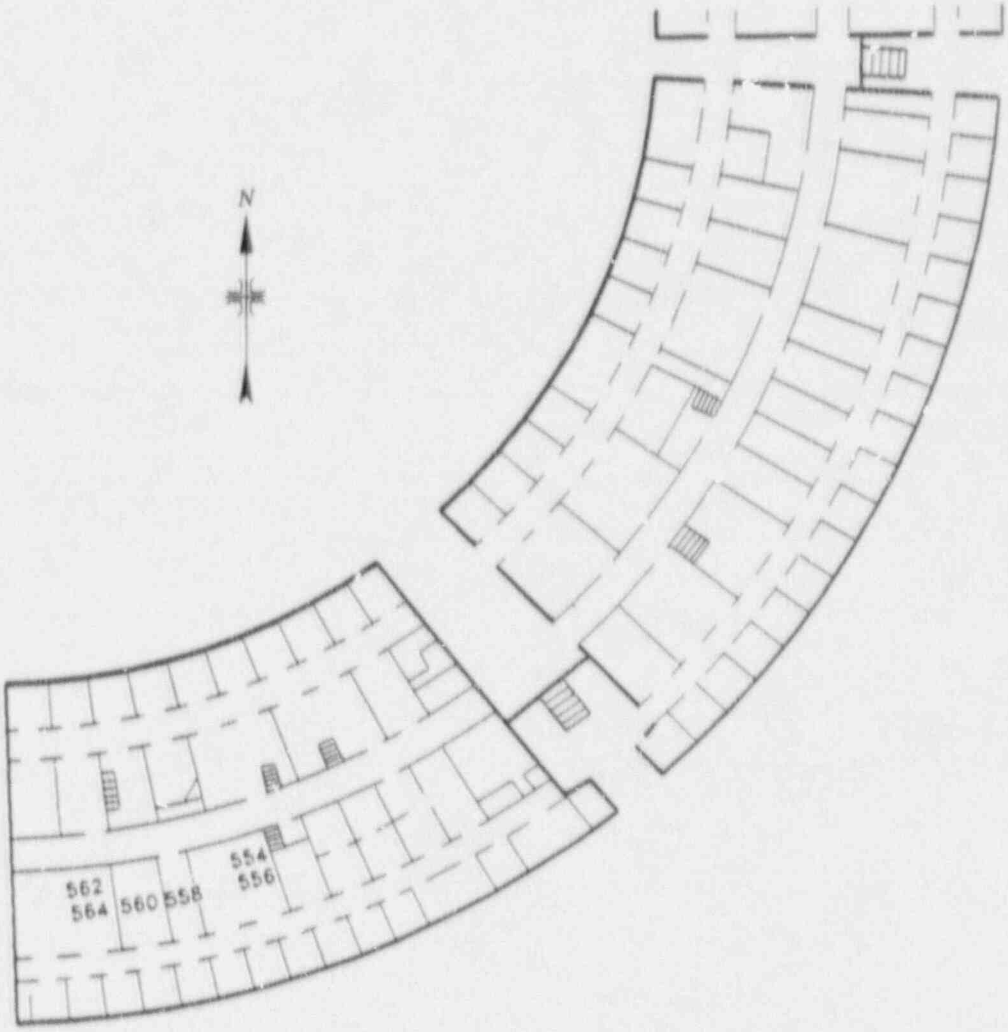


FIGURE 5: Section A of Building 2, Indicating Rooms Included in Group 4 Decommissioning

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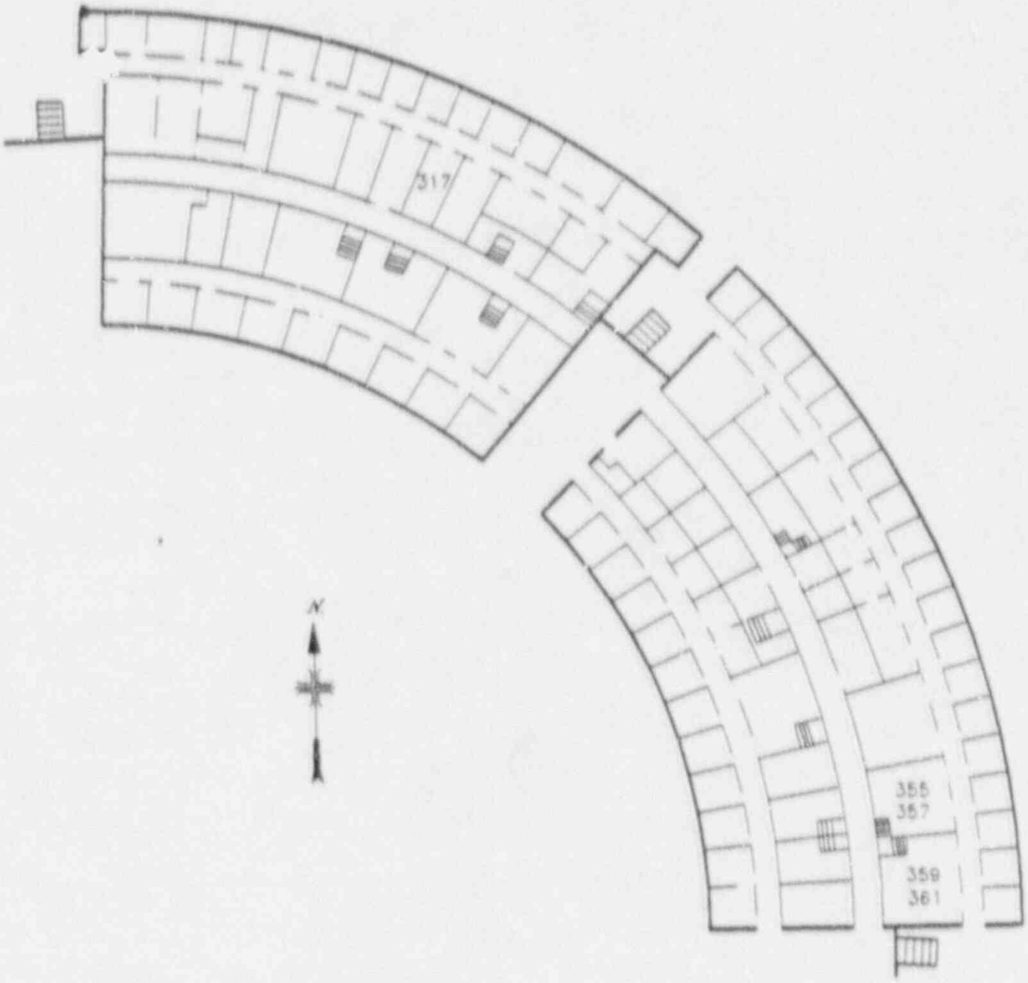

FIGURE 6: Section C of Building 2, Indicating Rooms Included in Group 4 Decommissioning

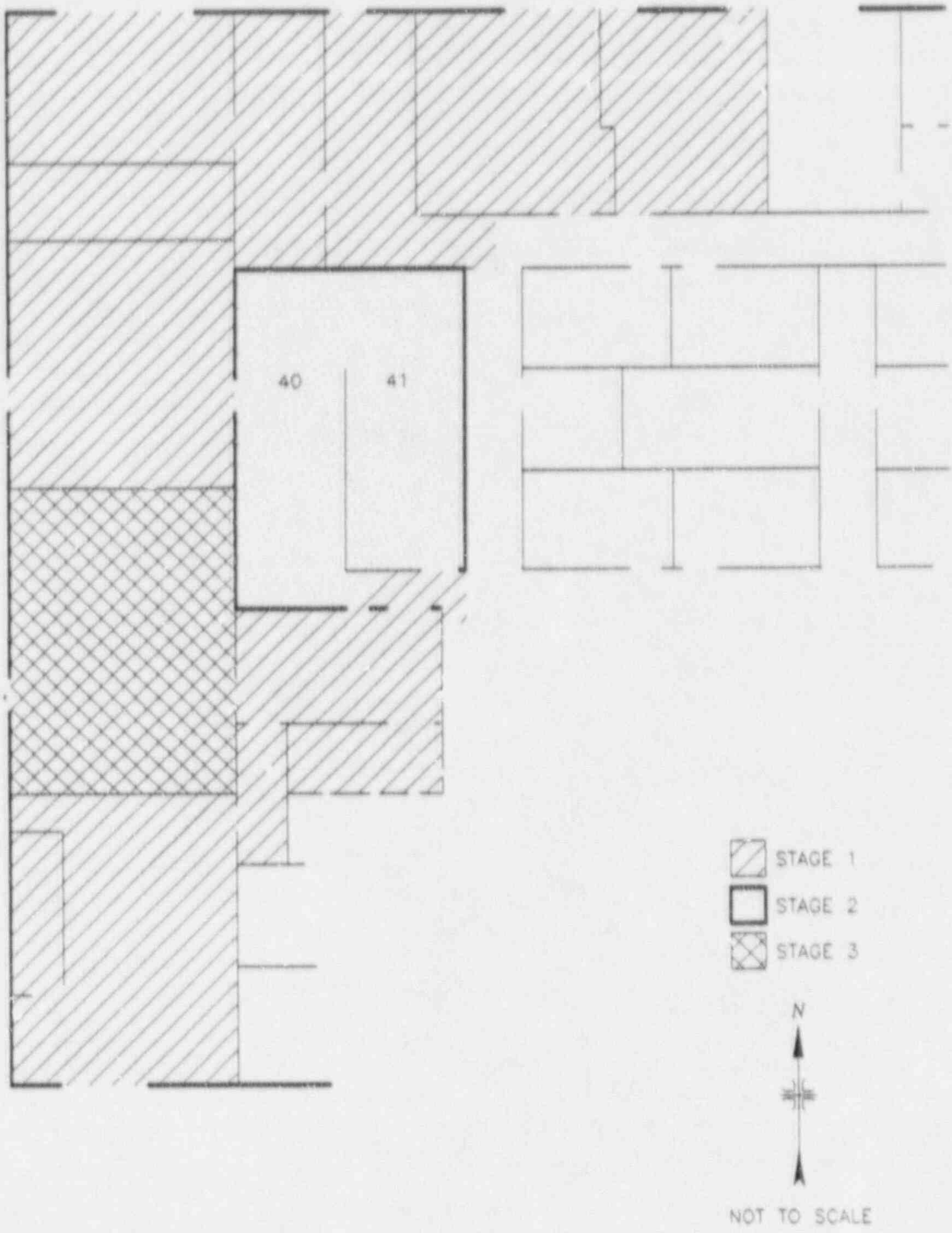

FIGURE 7: Decontamination Stages for the "Hot Suite" Area Building 9

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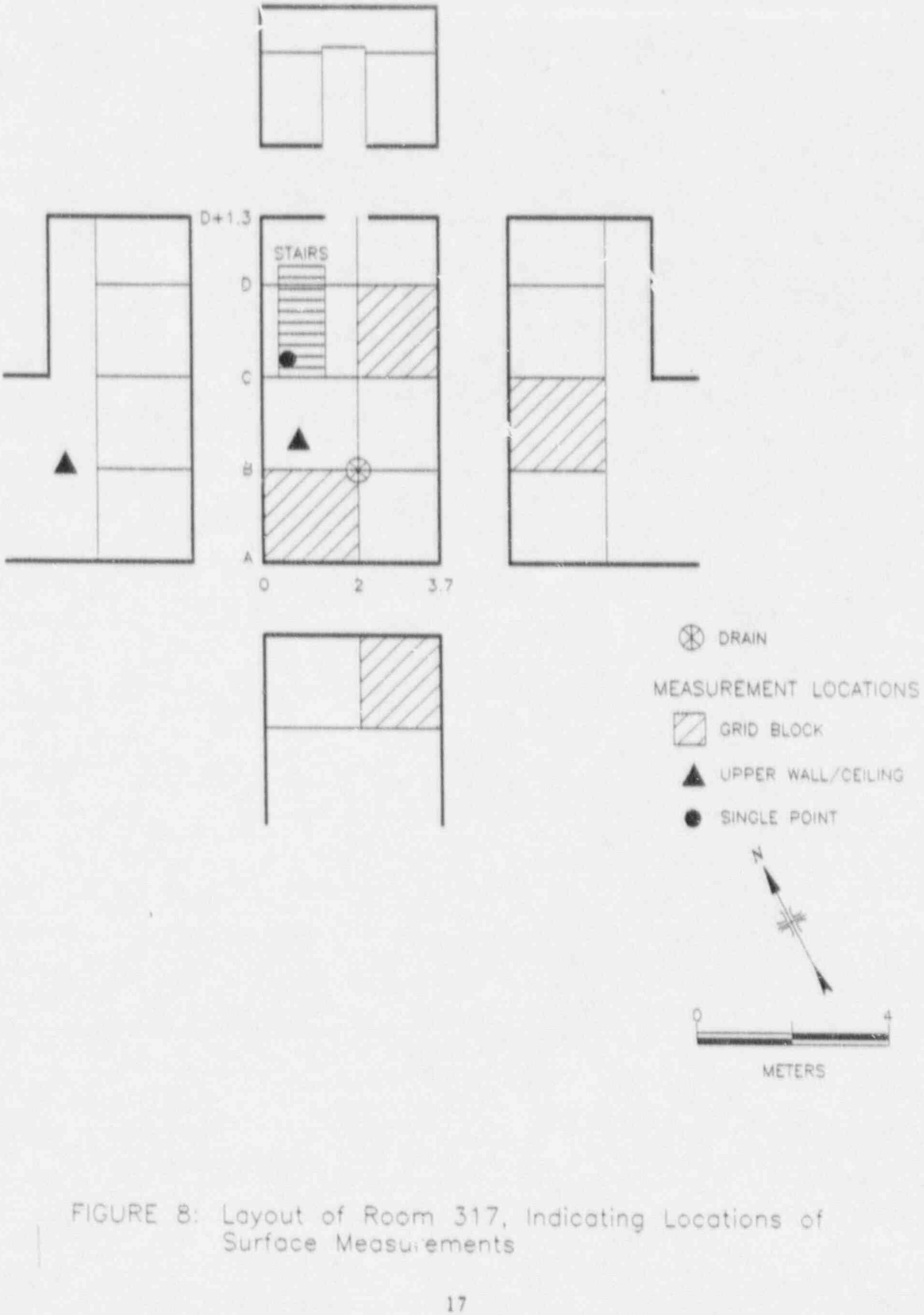

FIGURE 8: Layout of Room 317, Indicating Locations of Surface Measurements

GAT72

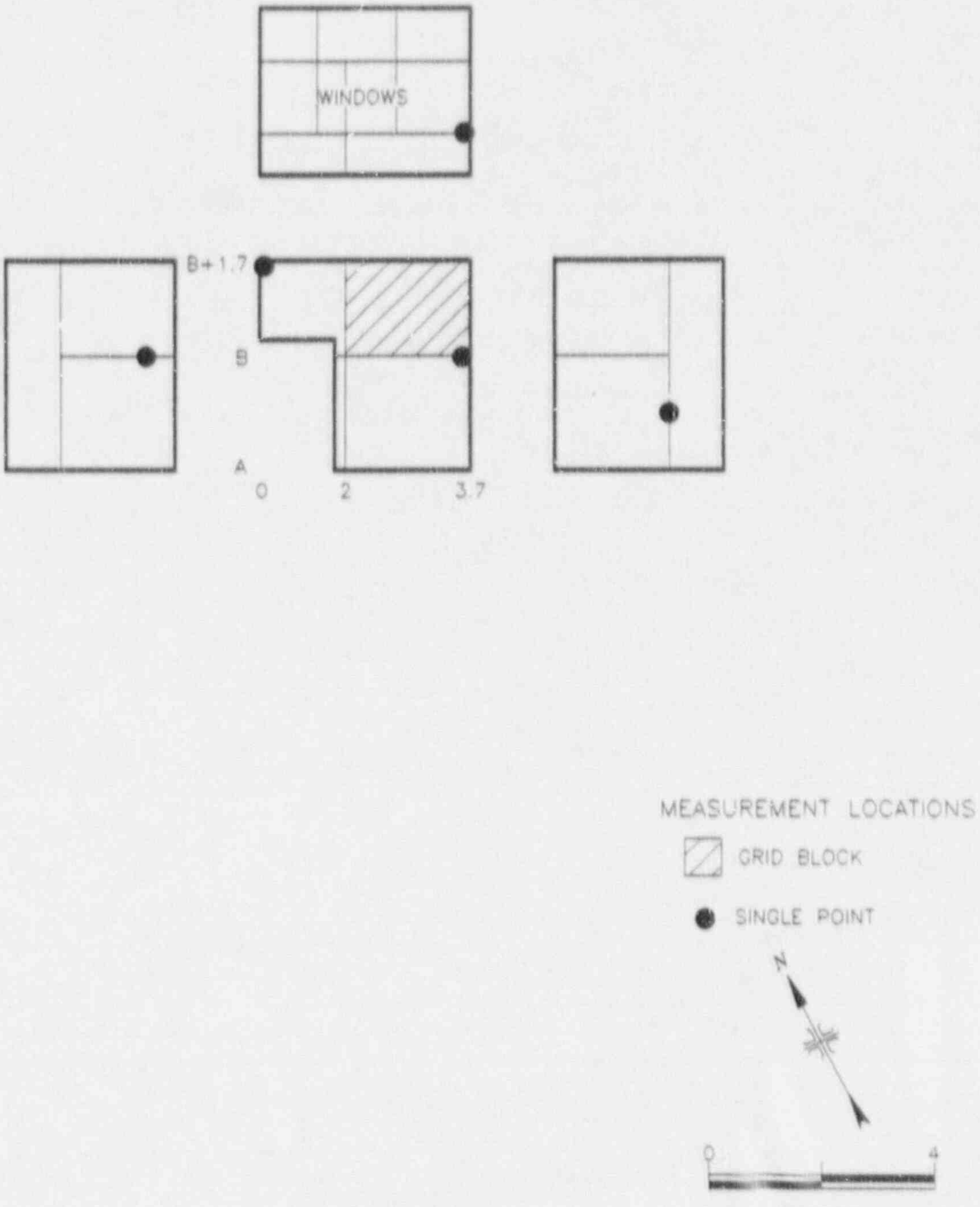

FIGURE 9: Layout of Room 317 Mezzanine, Indicating Locations of Surface Measurements

GAT73

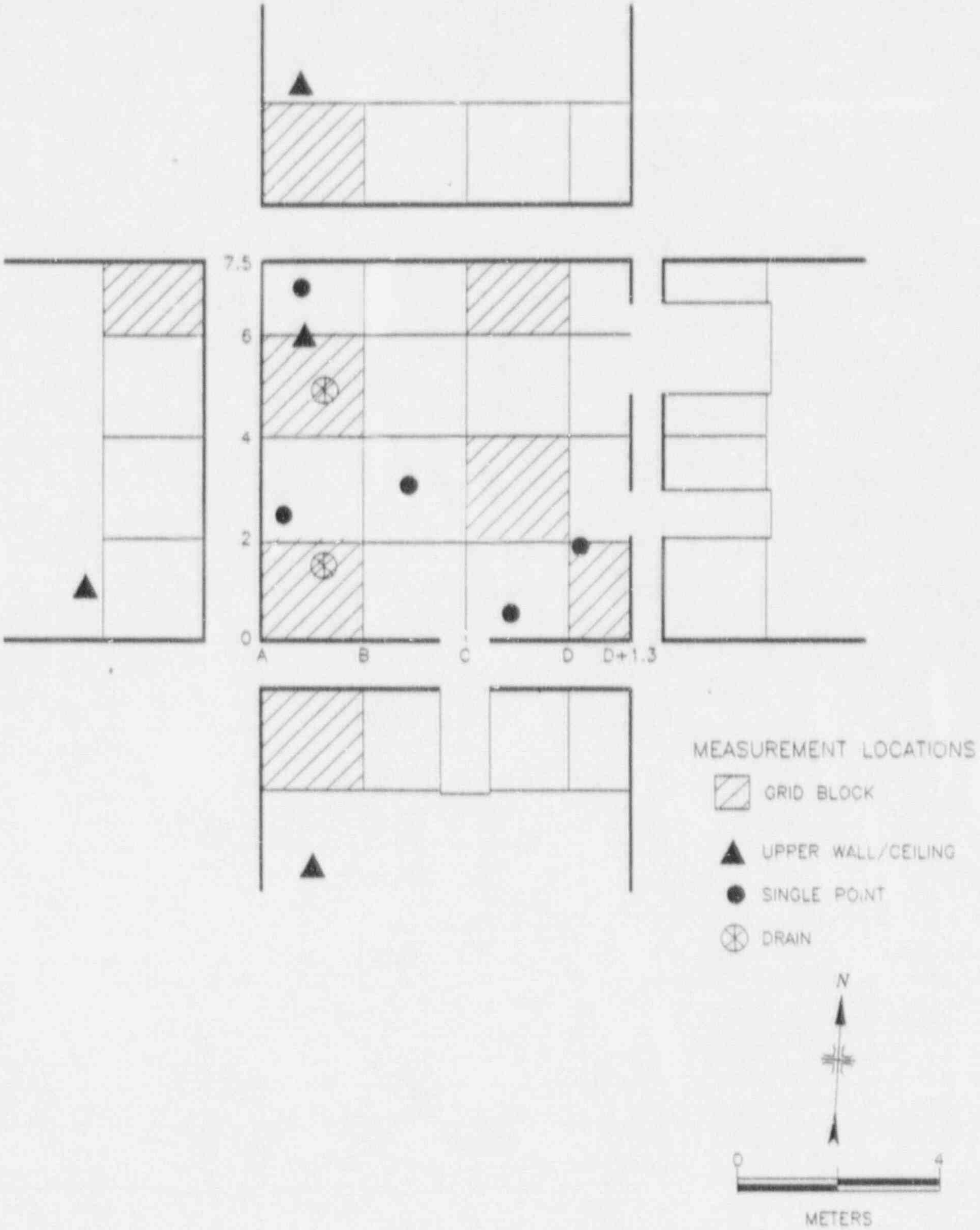

FIGURE 10: Layout of Room 355/357, Indicating Locations of Surface Measurements

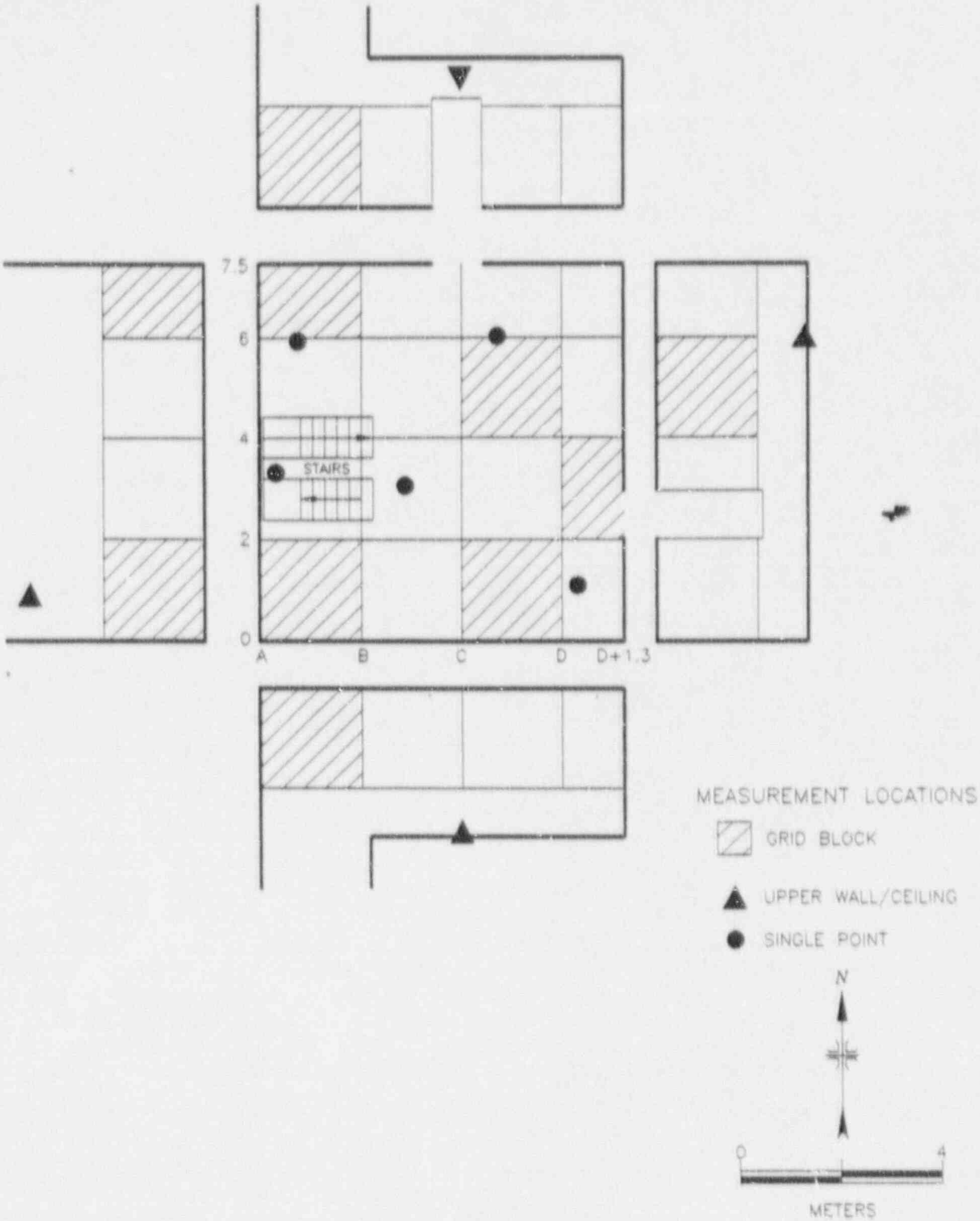

FIGURE 11: Layout of Room 359/361, Indicating Locations of Surface Measurements

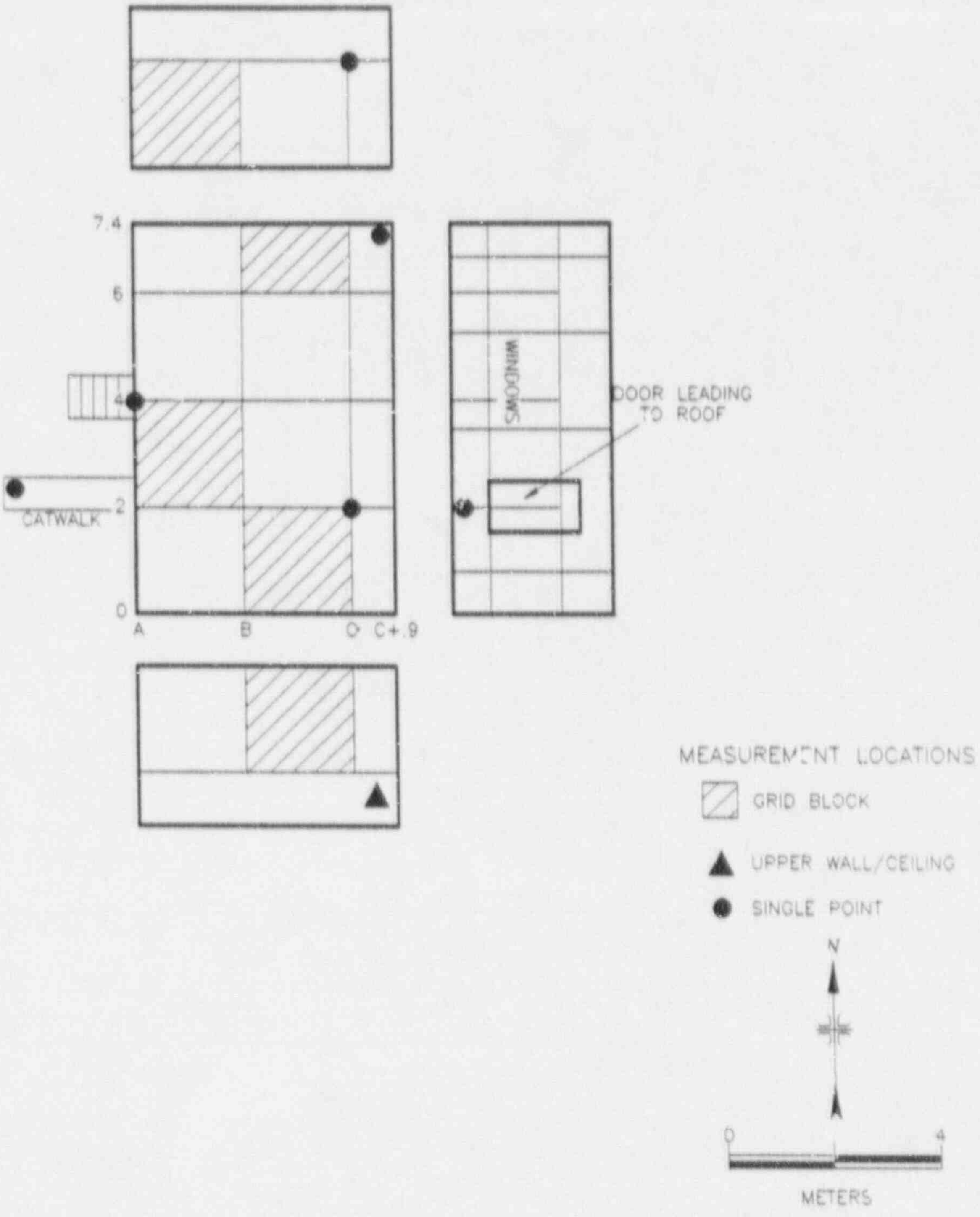

FIGURE 12: Layout of Room 359/361 Mezzanine, Indicating Locations of Surface Measurements

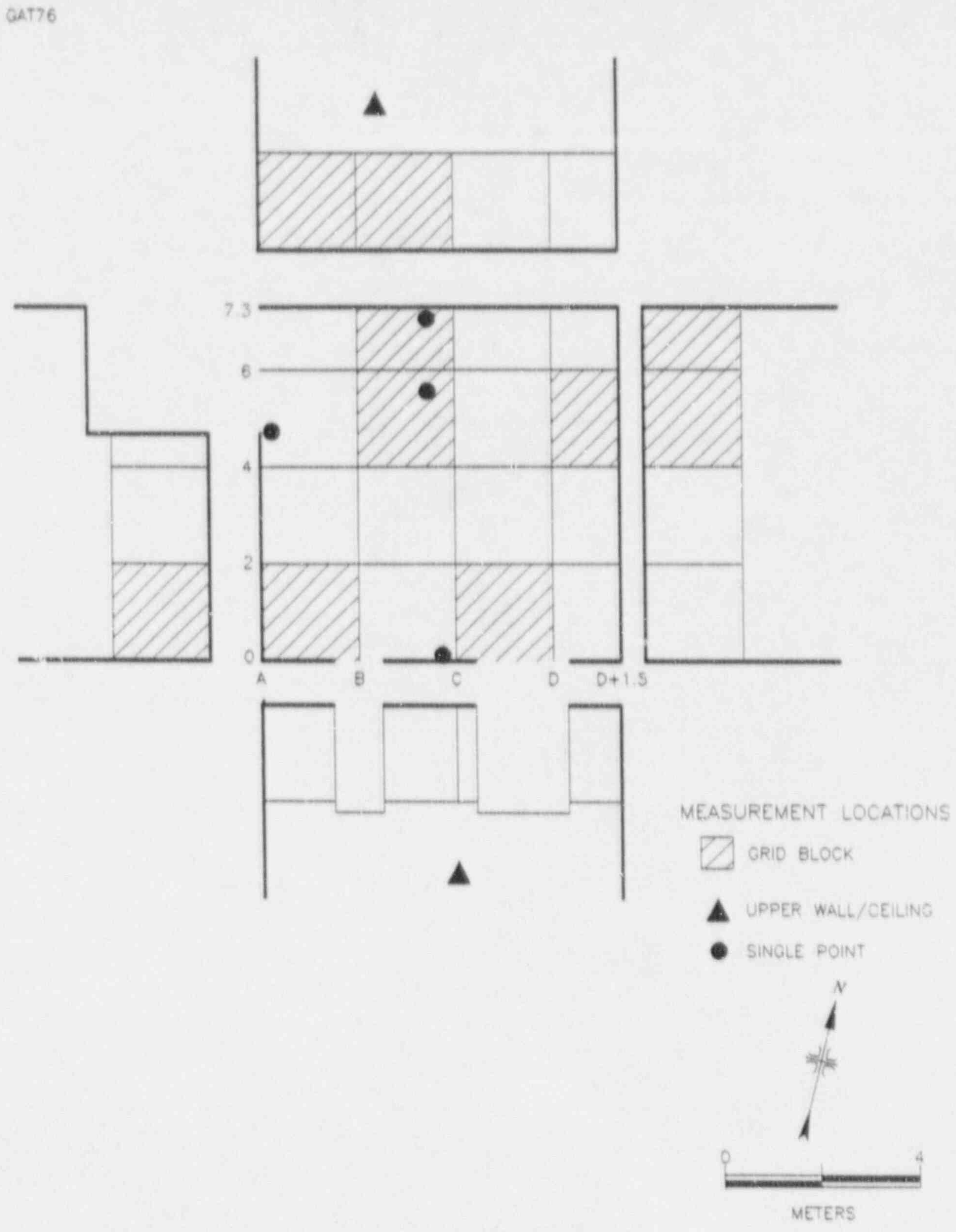

FIGURE 13: Layout of Room 554/556, Indicating Locations of Surface Measurements

GAT77

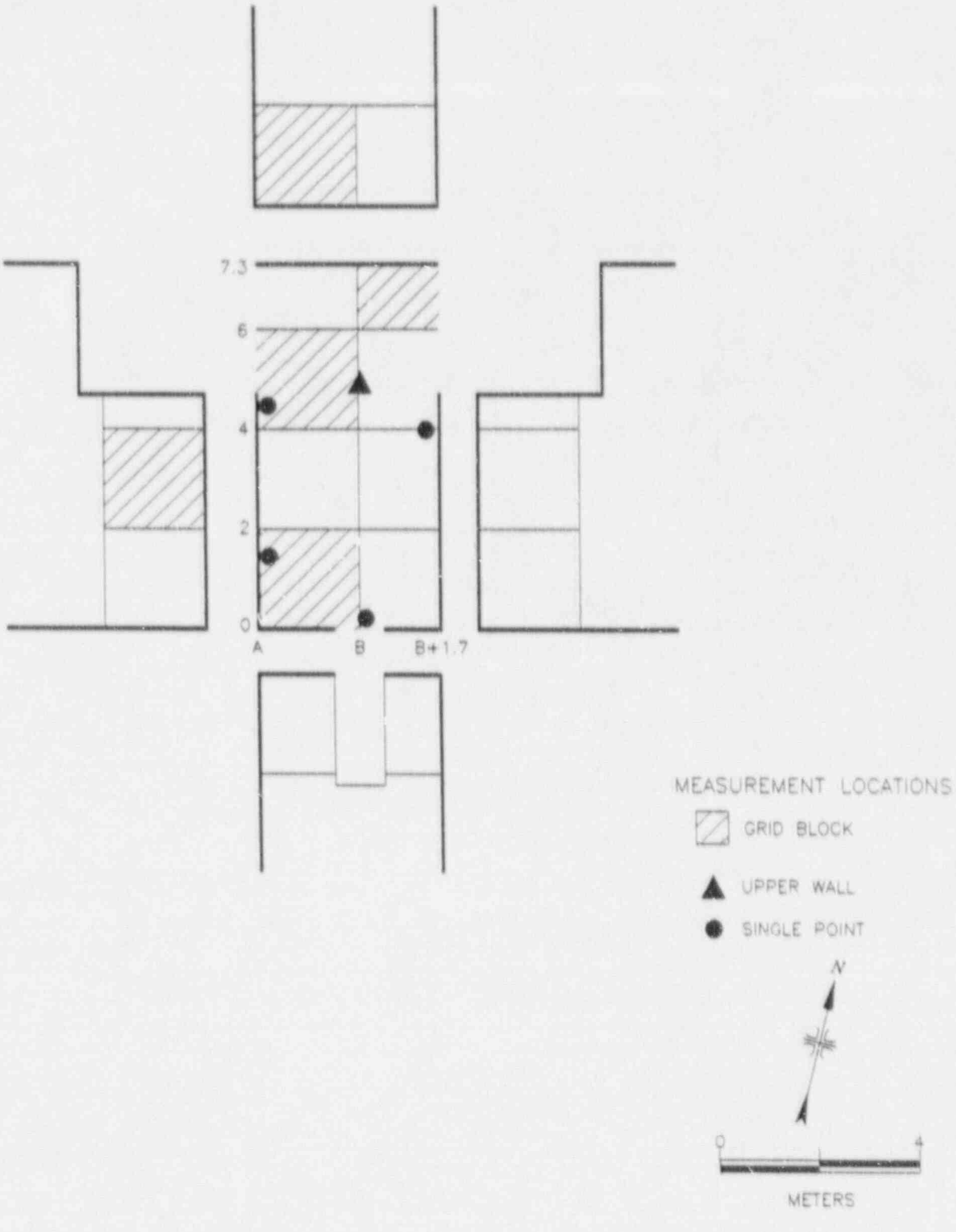

FIGURE 14: Layout of Room 558, Indicating Locations of Surface Measurements

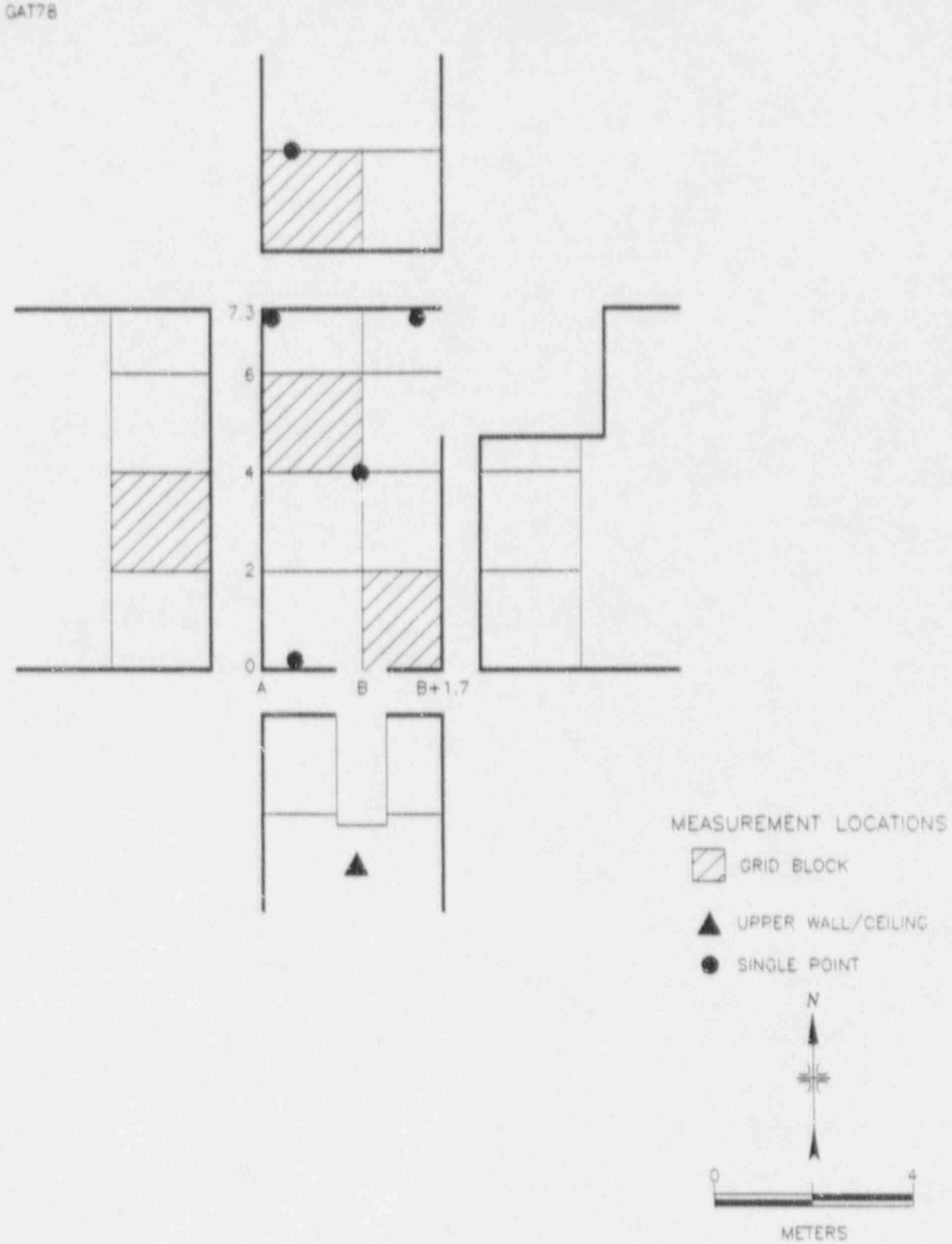

FIGURE 15: Layout of Room 560, Indicating Locations of Surface Measurements

GAT79

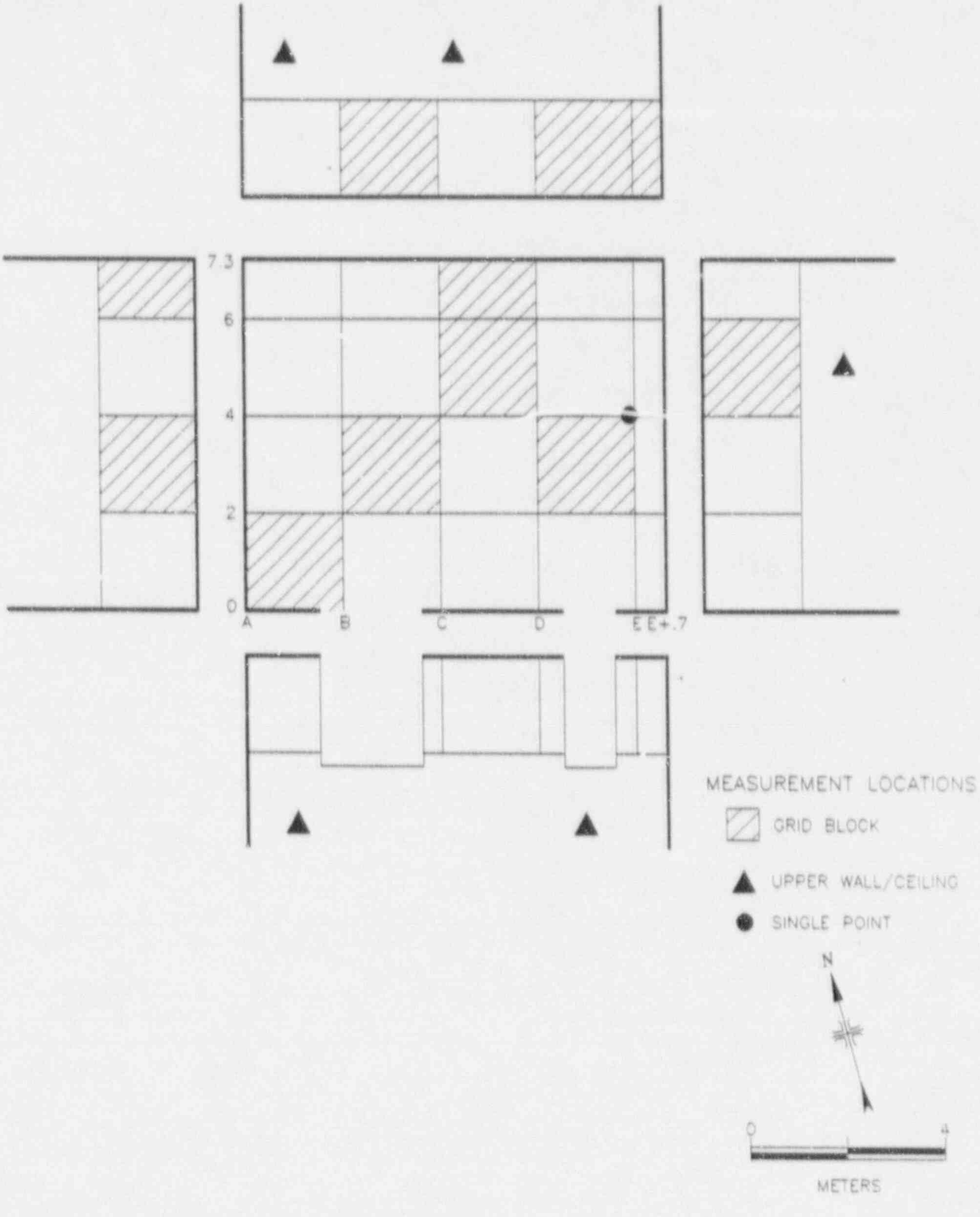

FIGURE 16: Layout of Room 562/564, Indicating Locations of Surface Measurements

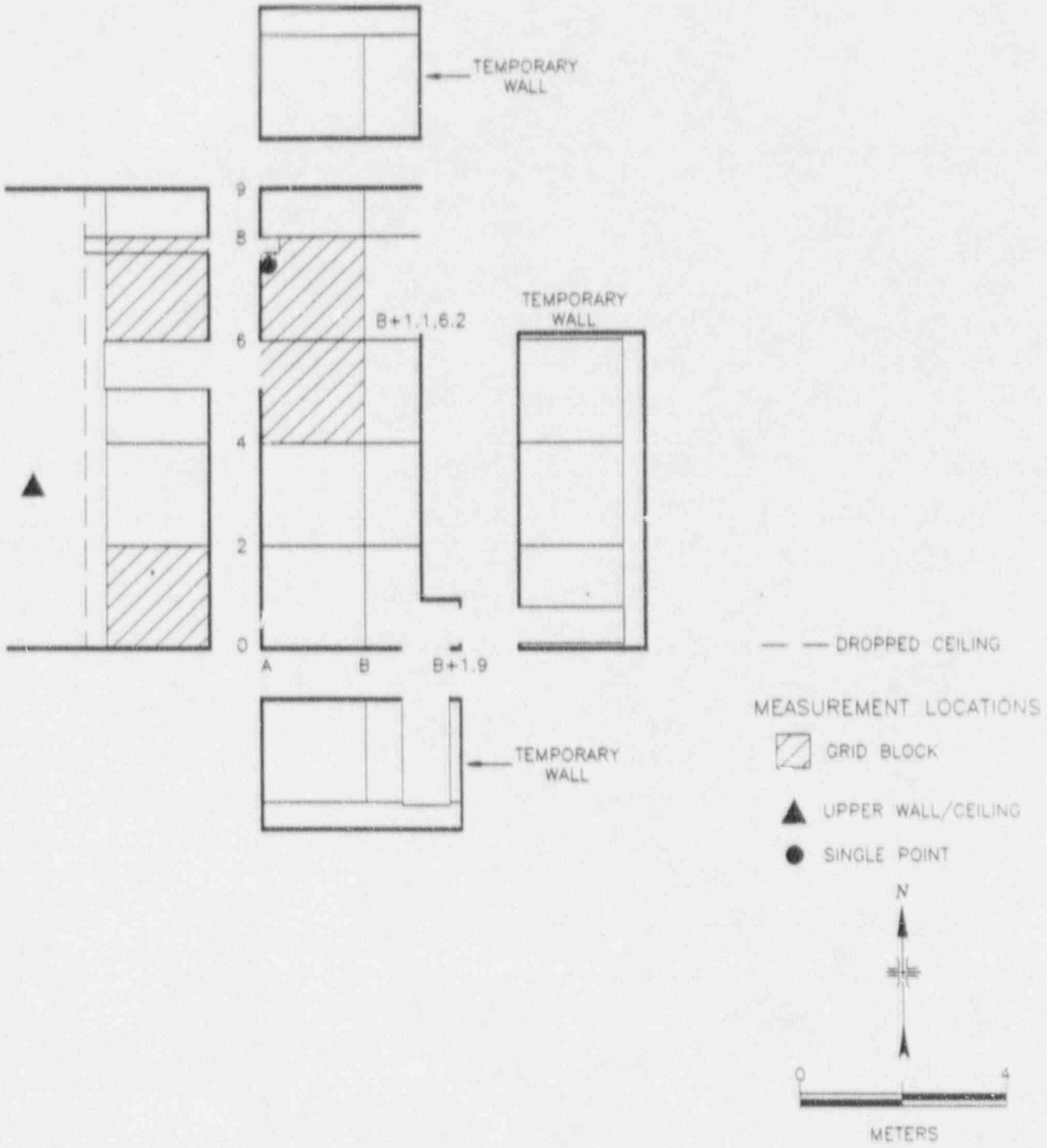

FIGURE 17: Layout of Room 40, Indicating Locations of Surface Measurements

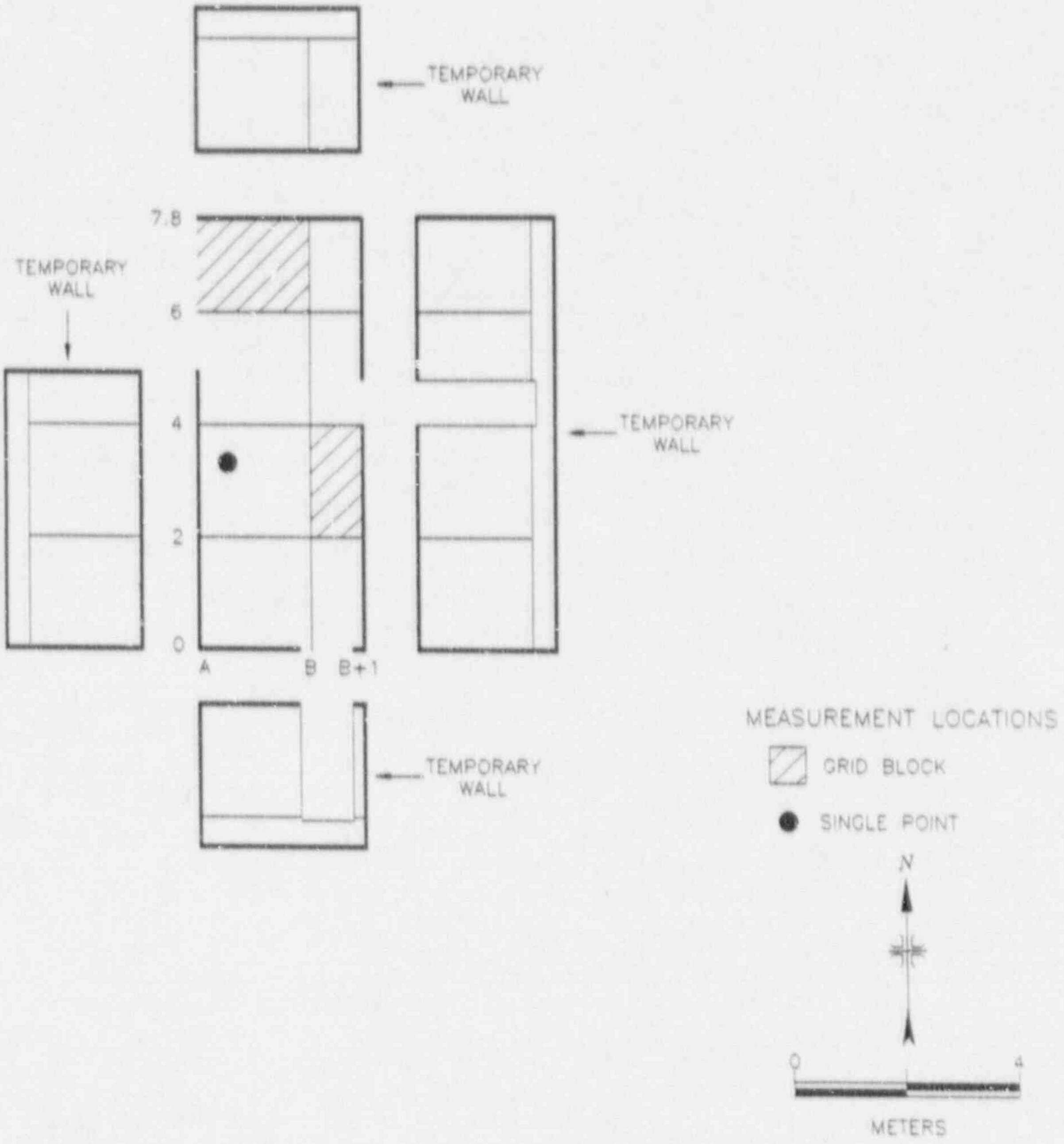

FIGURE 18: Layout of Room 41, Indicating Locations of Surface Measurements

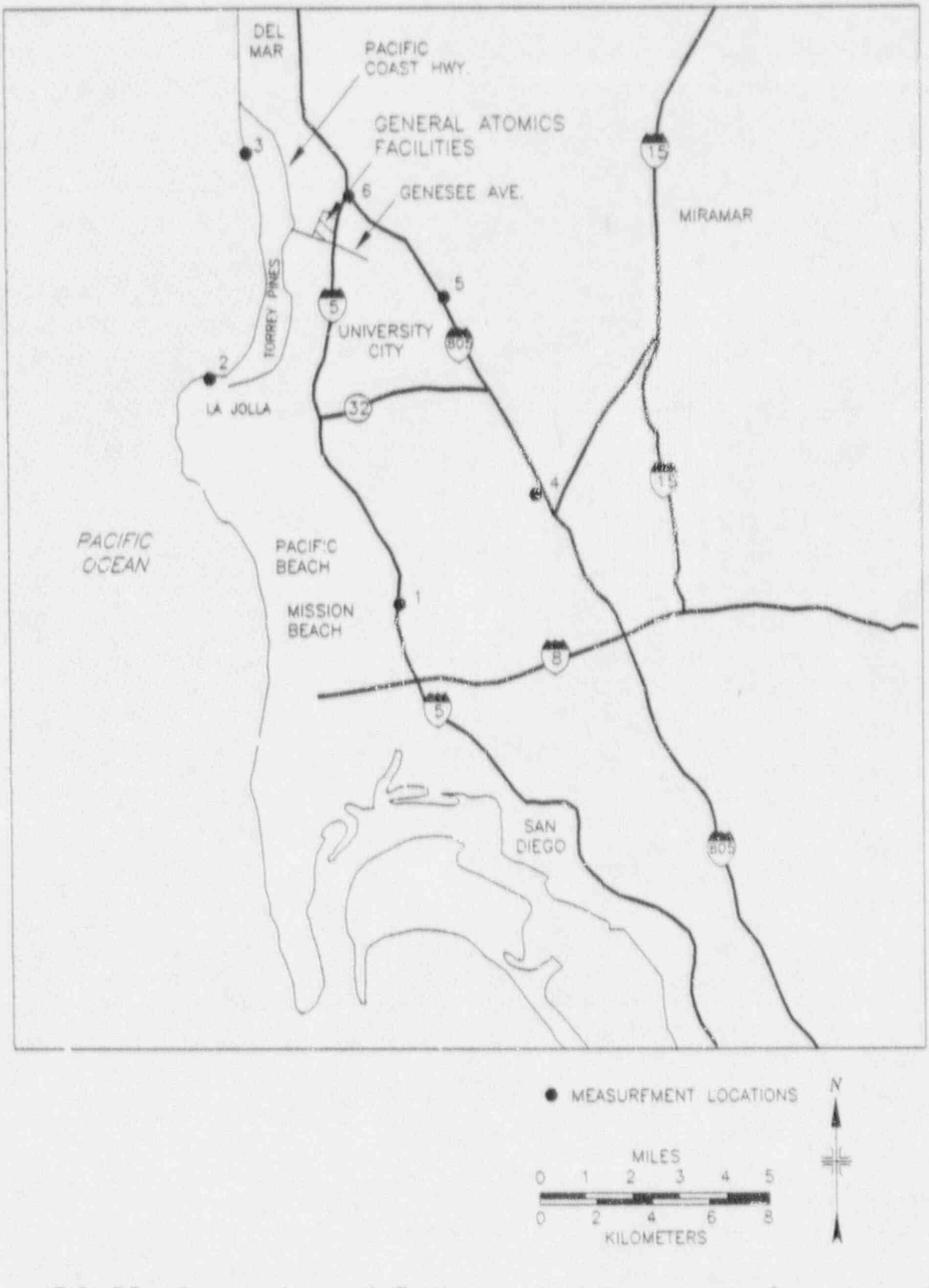

FIGURE 19: Locations of Background Measurements from the Vicinity of General Atomics

TABLE 1

BACKGROUND RADIATION LEVELS
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA[a]

Location[b]	Gamma Exposure Rates at 1 m Above the Surface (μR/h)	Gamma Exposure Rates at the Surface (μR/h)
1	7	8
2	8	8
3	7	7
4	10	10
5	13	15
6	13	15
Range	7 to 13	7 to 15
Average	10	11

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[a] Data obtained during confirmatory survey of phase I decommissioning activities (1.)
[b] Refer to Figure 19.

TABLE 2

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

ROOM OR AREA[a]	LOCATION	# OF GRID BLOCKS OR LOCATIONS MEASURED	HIGHEST GRID BLOCK AVERAGE (dpm/100 cm^2)		TOTAL ACTIVITY (dpm/100 cm^2)		REMOVABLE ACTIVITY[g] (dpm/100 cm^2)	
			ALPHA	BETA	ALPHA RANGE	BETA-GAMMA RANGE	ALPHA RANGE	BETA-GAMMA RANGE
317	Floor	2[b]	<25	1100	<25	430-1800	<3	<6
	Lower Walls	2[b]	<25	850	<25- 37	<410-1300	<3- 3	<6
	Upper Walls & Ceiling	2[c]	N/A[d]	N/A	<25	<410	<3- 5	<6
	Miscellaneous	1[c] (drain)	N/A	N/A	--[e]	<410	<3	<6
317 Mezzanine	Floor	1[b]/1[c]	<25	<410	<25	<410	<3	<6
	Lower Walls	3[c]	N/A	N/A	<25	<410- 480	<3	<6
	Miscellaneous	1[c] (sink)	N/A	N/A	<25	690	<3	<6
355/357[f]	Floor	5[b]/4[c]	40	480	<25-190	<410- 800	<3- 3	<6
	Lower Walls	3[b]	150	<410	<25-450	<410- 430	<3- 3	<6- 6
	Upper Walls & Ceiling	4[c]	N/A	N/A	<25- 60	<410	<3- 7	<6- 7
	Miscellaneous	1[c]	N/A	N/A	88	1400	<3	<6
359/361[f]	Floor	5[b]/4[c]	89	750	<25-140	<410-1280	<3	<6-10
	Lower Walls	5[b]	120	<410	<25-160	<410- 450	<3- 3	<6- 7
	Upper Walls & Ceiling	4[c]	N/A	N/A	36-480	<410-5000	<3- 5	<6- 9
359/361[f] Mezzanine	Floor	3[b]/4[c]	27	<410	<25-830	<410-1100	<3-21	<6-18
	Lower Walls	2[b]/2[c]	130	<410	45-240	<410	<3- 9	<6- 6
	Upper Walls & Ceiling	1[c]	N/A	N/A	45	<410	<3	<6

TABLE 2 (continued)

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
BUILDING 2, L BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

ROOM OR AREA[a]	LOCATION	# OF GRID BLOCKS OR LOCATIONS MEASURED	HIGHEST GRID BLOCK AVERAGE (dpm/100 cm^2)		TOTAL ACTIVITY (dpm/100 cm^2)		REMOVABLE ACTIVITY[g] (dpm/100 cm^2)	
			ALPHA	BETA	ALPHA RANGE	BETA-GAMMA RANGE	ALPHA RANGE	BETA-GAMMA RANGE
544/556[f]	Floor	$5^b/4^c$	<25	1400	<25- 44	<410-1600	<3- 3	<6-12
	Lower Walls	5^b	62	770	<25- 98	<410-1100	<3- 3	<6- 6
	Upper Walls & Ceiling	2^c	N/A	N/A	<25- 71	<410- 640	<3- 3	<6
558	Floor	$3^b/5^c$	<25	750	<25	410-1400	<3	<6
	Lower Walls	2^b	<25	<410	<25- 35	<410- 850	<3	<6- 7
	Upper Walls & Ceiling	1^c	N/A	N/A	38	<410	<3	<6
560	Floor	$2^b/4^c$	28	680	<25- 56	<410-1400	<3	<6- 8
	Lower Walls	2^b	<25	410	<25- 38	<410- 640	<3	<6- 6
	Upper Walls & Ceiling	2^c	N/A	N/A	<25	<410	3	<6- 9
562/564[f]	Floor	5^b	<25	1400	<25	560-1500	<3	<6
	Lower Walls	5^b	<25	1200	<25- 88	<410-1300	<3- 3	<6
	Upper Walls & Ceiling	6^c	N/A	N/A	<25- 38	<410-1100	<3- 3	<6- 7

[a] Refer to Figures 8 to 16.

[b] Five point measurement.

[c] Single point measurement.

[d] N/A; Not Applicable.

e--;measurement not performed, area too small to accommodate probe.

[f] Rooms were gridded together.

[g] Removable H-3 activity for all smears was < 70 dpm/100 cm^2.

TABLE 3

RADIONUCLIDE CONCENTRATIONS IN RESIDUE SAMPLES
BUILDING 2, L BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

ROOM[a]	GRID LOCATION	RADIONUCLIDE CONCENTRATIONS (pCi/g)					
		Co-60	Cs-137	U-235	U-238	Th-228	Th-232
317	B, 2	<2.0	2.1 ± 1.3[b]	1.3 ± 1.2	25 ± 14	2.3 ± 1.8	<6
355/357	A+1.5, 1.8	<7.0	2.9 ± 2.6	22 ± 18	120 ± 28	7 ± 4	23 ± 13

[a] Refer to Figures 8 and 10.

[b] Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.

TABLE 4

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
BUILDING 9, E BUILDING COMPLEX
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

ROOM OR AREA[a]	LOCATION	# OF GRID BLOCKS OR LOCATIONS MEASURED	HIGHEST GRID BLOCK AVERAGE (dpm/100 cm^2)		TOTAL ACTIVITY (dpm/100 cm^2)		REMOVABLE ACTIVITY (dpm/100 cm^2)	
			ALPHA	BETA	ALPHA RANGE	BETA-GAMMA RANGE	ALPHA RANGE	BETA-GAMMA RANGE
40	Floor	$2^b/1^c$	430	990	<25-1200	<410-2300	<3- 5	<6
	Lower Walls	2^b	<25	<410	<25	<410	<3- 3	<6
	Upper Walls	1^c	N/A[d]	N/A	<25	<410	5	<6
41	Floor	$1^b/1^c$	270	720	<25- 510	<410-1300	<3	<6- 7

[a] Refer to Figures 17 and 18.

[b] Five point measurement.

[c] Single point measurement.

[d] N/A; Not Applicable.

REFERENCES

1. "Confirmatory Survey of Phase I Decommissioning, Former Waste Processing Facility, GA Technologies, San Diego, California," Oak Ridge Associated Universities, July 1986.

2. "Confirmatory Survey of Phase II Decommissioning, Former Waste Processing Facility, GA Technologies, San Diego, California," Oak Ridge Associated Universities, March 1987.

3. "Confirmatory Survey of Phase III Decommissioning, GA Technologies, San Diego, California," Oak Ridge Associated Universities, February 1988.

4. "Confirmatory Survey of Phase IV Decommissioning, General Atomics, San Diego, California," Oak Ridge Associated Universities, November 1988.

5. "Confirmatory Survey of Facilities in Buildings 2 and 9, General Atomics, San Diego, California," Oak Ridge Associated Universities, July 1989.

6. General Atomics. *Decontamination of Selected General Atomics Science Laboratories For Release To Unrestricted Use (Group 4)*, San Diego, California, September 12, 1989.

7. General Atomics. *Decontamination of the "Hot Suite" Area of the TRIGA Fuel Fabrication Facility Formerly Located in Building 9 For Release To Unrestricted Use*, Stage 2, San Diego, California, August 31, 1989.

APPENDIX A

MAJOR SAMPLING AND ANALYTICAL EQUIPMENT

APPENDIX A

MAJOR SAMPLING AND ANALYTICAL EQUIPMENT

The display or description of a specific product is not to be construed as an endorsement of that product or its manufacturer by the authors or their employer.

A. Direct Radiation Measurements

Eberline "RASCAL"
Portable Ratemeter-Scaler
Model PRS-1
(Eberline, Santa Fe, NM)

Eberline PRM-6
Portable Ratemeter
(Eberline, Santa Fe, NM)

Eberline Alpha Scintillation Detector
Model AC-3-7
(Eberline, Santa Fe, NM)

Eberline Beta-Gamma "Pancake" Detector
Model HP-260
(Eberline, Santa Fe, NM)

Victoreen NaI Scintillation Detector
Model 489-55
(Victoreen, Cleveland, OH)

Ludlum Alpha-Beta Floor Monitor
Model 239-1
(Ludlum, Sweetwater, TX)

Ludlum Portable Ratemeter-Scaler
Model 2220
(Ludlum, Sweetwater, TX)

B. Laboratory Analyses

Automatic Low Background Alpha-Beta Counter
Model LB-5110
(Tennelec, Oak Ridge, TN)

Liquid Scintillation Counter
Model Tri-Carb 300
(Packard Instrument Company, Downers Grove, IL)

High-Purity Germanium Detector
Model GMX-23195-S, 23% efficiency
(EG&G ORTEC, Oak Ridge, TN)

Used in conjunction with:
Lead Shield, G-16
(Gamma Products, Inc., Palos Hills, IL)

Multichannel Analyzer
ND-66/ND-680 System
(Nuclear Data Inc., Schaumburg, IL)

APPENDIX B

MEASUREMENT AND ANALYTICAL PROCEDURES

APPENDIX B

MEASUREMENT AND ANALYTICAL PROCEDURES

Surface Scans

Surface scans were performed by passing the probes slowly over the surface; the distance between the probe and the surface was maintained at a minimum - nominally about 1 cm. Identification of elevated levels was based on increases in the audible signal from the recording or indicating instrument. Scans of large surface areas on the floor of the facility were accomplished by use of a gas proportional floor monitor, with a 550 cm^2 sensitive area. The detector was slowly moved in a systematic pattern to cover 100% of the accessible floor area. Other surfaces were scanned using smaller, hand-held detectors. Combinations of detectors and instrument for the scans were:

Beta-Gamma - Pancake GM probe with PRM-6 ratemeter.
Beta-Gamma - Pancake GM probe with PRS-1 scaler/ratemeter.
Gamma - NaI scintillation detector (3.2 cm x 3.8 cm crystal) with PRM-6 ratemeter.
Alpha-Beta - Gas Proportional Floor Monitor with Ludlum Model 2220 Scaler/ratemeter

Alpha and Beta-Gamma Surface Measurements

Measurements of total alpha activity levels were performed using Eberline Model PRS-1 portable scaler/ratemeters with Model AC-3-7 alpha scintillation probes. Measurements of total beta-gamma activity levels were performed using Eberline Model PRS-1 portable scaler/ratemeters with Model HP-260 thin-window "pancake" G-M probes. Count rates (cpm) were converted to disintegration rates (dpm/100 cm^2) by dividing the net rate by the 4 π efficiency and correcting for the active area of the detector. Effective window areas were 59 cm^2 for the

ZnS detectors and 15 cm^2 for the GM detectors. The background count rate for ZnS alpha probes averaged approximately 2 cpm; the average background count rate was approximately 40 cpm for the G-M detectors.

Removable Activity Measurements

Smears for determination of removable activity were performed using numbered filter paper disks, 47 mm in diameter; smears were sealed in labeled envelopes with the locations and other pertinent information recorded. The smears were returned to laboratories in Oak Ridge and counted on a low-background gas-proportional counter for gross alpha and gross beta activity. The removable tritium activity level was determined by cutting smear paper into small 6 mm pieces and placing them into a liquid scintillation "cocktail." An unused smear was used to correct for background, and another was spiked with an NIST traceable tritium standard to provide an internal calibration factor and compensate for instrument drift. All samples were counted on a Model Tri-Carb 300 liquid scintillation counter.

Residue Sample Analysis

Residue samples were dried, mixed, and an aliquot sealed in an appropriate container, chosen to reproduce the calibrated counting geometry. Samples were counted on intrinsic germanium detectors coupled to a Nuclear Data Model ND-680 pulse height analyzer system. Background and Compton stripping, peak search, peak identification, and concentration calculations were performed using the computer capabilities inherent in the analyzer system. Energy peaks for radionuclides of concern were:

Co-60	1.173 MeV
Cs-137	0.662 MeV
U-235	0.144 MeV
U-238	0.094 MeV from Th-234 (secular equilibrium assumed)
Th-232	0.911 MeV from Ac-228 (secular equilibrium assumed)

Spectra were also reviewed for the presence of other radionuclides.

Uncertainties and Detection Limits

The uncertainties associated with the analytical data presented in the tables of this report, represent the 95% confidence levels for that data. These uncertainties were calculated based on both the gross sample count levels and the associated background count levels. When the net sample count was less than the 95% statistical deviation of the background count, the sample concentration was reported as less than the detection limits of the measurement procedure. Because of variations in background levels, sample volumes or weights, measurement efficiencies, and Compton contributions from other radionuclides in samples, the detection limits differ from sample to sample and instrument to instrument. Additional uncertainties of ± 6 to 10%, associated with sampling and laboratory procedures, have not been propagated into the data presented in this report.

Calibration and Quality Assurance

Laboratory and field survey procedures are documented in manuals developed specifically for the Oak Ridge Associated Universities' Environmental Survey and Site Assessment Program.

With the exception of the measurements conducted with portable gamma scintillation survey meters, instruments were calibrated with NIST-traceable standards. The calibration procedures for the portable gamma instruments are performed by comparison with an NIST calibrated pressurized ionization chamber.

Quality control procedures on all instruments included daily background and check-source measurements to confirm equipment operation within acceptable statistical fluctuations. The ORAU laboratory participates in the EPA and DOE/EML Quality Assurance Programs.

APPENDIX C

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BY-PRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIAL

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE, OR SPECIAL NUCLEAR MATERIAL

U.S. Nuclear Regulatory Commission
Divison of Fuel Cycle & Material Safety
Washington, D.C. 20555

July 1982

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces or premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer of premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

    a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

    b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of

the survey report shall be filed with the Division of Fuel Cycle and Material Safety, USNRC, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

a. Identify the premises.

b. Show that reasonable effort has been made to eliminate residual contamination.

c. Describe the scope of the survey and general procedures followed.

d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223 Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

---

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] the maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

APPENDIX D

STATE OF CALIFORNIA DEPARTMENT OF HEALTH SERVICES CRITERIA FOR RELEASE OF FACILITIES AND EQUIPMENT TO UNRESTRICTED USE

ACCEPTABLE SURFACE CONTAMINATION LEVELS

	NUCLIDE[a]	AVERAGE[b,c] (dpm/100 cm^2)	MAXIMUM[b,d] (dpm/100 cm^2)	REMOVABLE[b,e] (dpm/100 cm^2)
1)	U-nat, U-235, U-238 and associated decay products	5,000	15,000	1,000
2)	Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
3)	Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
4)	Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	15,000	1,000
5)	H-3, C-14 except as DNA precursors[f]	20,000	60,000	4,000

---

[a] Here surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] Is used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive

material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] DNA precursors mean molecules or compounds that are directly incorporated into the DNA molecule during DNA biosythesis, e.g. purine and pyrimidine bases and their analogs, nucleotides and nucleosides. The acceptable surface contamination levels for H-3 and C-14 in DNA precursors are as tabulated in paragraph (d) for beta-gamma-emitters.

USNRC Regulatory Guide 1.86 Termination of Operating Licenses for Nuclear Reactors, Washington D.C. (June 1974)

ANSI, Control of Radioactive Surface Contamination on Materials, Equipment and Facilities To Be Released for Uncontrolled Use, final draft, proposed American National Standard N-328, Atomic Industrial Forum, Inc., N.Y. (June 1974)

Atomic Industrial Forum, Inc., N.Y. (June 1974)

APPENDIX E

LETTER FROM B. K. TAMPLIN AND C. WONG
(STATE OF CALIFORNIA DEPARTMENT OF HEALTH SERVICES) TO
K. WONG (STATE OF CALIFORNIA DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF OCCUPATIONAL SAFETY AND HEALTH RADIATION HEALTH UNIT)

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF HEALTH SERVICES
2151 BERKELEY WAY
BERKELEY, CA 94704

CW

Kim Wong
State of California
Dept. of Industrial Relations
Div. of Occup. Safety & Health
Radiation Health Unit
6150 Van Nuys, Room 405
Van Nuys, CA 91401-3379

November 28, 1989

File General Atomics
Inspection folder

FW

Dear Mr. Wong,

Included are the results for the samples taken at General Atomics on October 25, 1989. We received one sewage effluent sample and three packages of wipe samples. Two of the packages for wipe samples, Bldg. 2/rooms 554/558/560, and Bldg.2/rooms 317-throat pipe, contained three wipe samples each. The third package, Bldg. 2/room 317, did not contain any samples.

The sewage effluent sample was gamma scanned as received for 500 minutes. No gamma emitters over the lower level of detection were found. After gamma scanning, a small portion of the sewage effluent sample was evaporated on a 2" stainless steel planchet. This planchet was counted in an internal proportional counter for gross alpha and in a low background counter for gross beta. The results for these analyses are shown below.

The two packages of wipe samples were gamma scanned together as a batch for 500 minutes. Again no gamma emitters over the lower level of detection were found. The wipe samples were then individually mounted on a 2" plastic planchet and covered with a thin mylar film. These samples were counted on a low background counter for both alpha and beta. The results are as follows:

SRL#	R#	Sample ID	Gross Alpha,pCi/Liter	Gross Beta,pCi/Liter
6556	13317	Sewage Eff.	39.4 +/- 23.2	-35.9 +/- 53.0
			no gamma emitters over the lower level of detection for a 500 minute scan.	

SRL#	R#	Sample ID	Gross Alpha,pCi/Wipe	Gross Beta,pCi/Wipe
6558	13319	Room 554&556	0.8 +/- 0.6	0.3 +/- 0.3
"	"	Room 558	0.5 +/- 0.5	0.3 +/- 0.3
"	"	Room 560	0.1 +/- 0.3	0.1 +/- 0.2
6559	13320	Room 317 Floor	0.7 +/- 0.4	0.4 +/- 0.2
"	"	Room 317 Pipe	-0.1 +/- 0.4	0.0 +/- 0.3
"	"	Room 314	0.0 +/- 0.4	-0.1 +/- 0.2

R. Tamplin, Ph.D.,Chief
Sanitation & Radiation Laboratory

Carolyn Wong

Carolyn Wong
Public Health Chemist

Received
12/5/89

NRC CORRESPONDENCE

OCT 1 1987

Docket No. 70-734

GA - Technologies, Inc.
P. O. Box 85608
San Diego, California 92138

Attention: Mr. R. N. Rademacher, Director
Human Resources

Gentlemen:

SUBJECT: INSPECTION AT GA - TECHNOLOGIES, INC. (CONFIRMATORY SURVEY)

This refers to a special inspection conducted by Messrs. R. D. Thomas and J. F. Pang of this office on August 18, 1987. The inspection consisted of a confirmatory radiological survey of an area which had been used for TRIGA fuel fabrication.

The areas examined during this inspection and the associated findings are described in the enclosed inspection report.

No violations were identified during this inspection.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document Room.

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,

James L. Montgomery, Chief
Nuclear Materials Safety and
Safeguards Branch

Enclosure:
Inspection Report No. 70-734/87-11

cc w/enclosure:
Dr. Keith E. Asmussen, Manager
Licensing and Nuclear Material Control

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 70-734/87-11

Docket No. 70-734

License No. SNM-696

Safeguards Group 1

Licensee: G.A. Technologies, Inc.
P. O. Box 85608
San Diego, California 92138

Facility Name: Same

Inspection at: Same

Inspection Conducted: August 18, 1987

Inspectors: (for)
R. D. Thomas, Chief
Nuclear Materials Safety Section
10-1-87
Date Signed

J. F. Pang
J. F. Pang, Radiation Specialist
9-30-87
Date Signed

Approved by: for MD Schuster
J. L. Montgomery, Chief
Nuclear Materials Safety and Safeguards Branch
10/1/87
Date Signed

Summary:

Inspection on August 18, 1987 (Report No. 70-734/87-11)

A decontamination confirmatory survey was conducted by NRC inspectors of the portions of the Experimental Building (E Building) in which NRC licensed activities (TRIGA fuel fabrication) had been conducted. The survey results indicate that the NRC licensed portions have been satisfactorily decontaminated by the licensee. The area is acceptable for release to unrestricted use.

DETAILS

1. Persons Contacted

Ben Kapel, Material License Reviewer, State of California
L. R. Quintana, Supervisor, Health Physics
K. Wong, Senior Health Physicist, State of California

2. Introduction

A final report by GA-Technologies, Inc. dated July 28, 1987 on the decontamination of the Experimental Building indicated that the building had been decontaminated to levels below the release limits and was acceptable for release to unrestricted use. Activities conducted within the building were authorized by State and NRC licenses. This report covers only the areas under the NRC license for TRIGA fuel fabrication.

A decontamination confirmatory survey of the portions of the Experimental Building where NRC licensed materials had been used was conducted on August 18, 1987. On the same day, State of California inspectors were conducting decontamination confirmatory surveys of portions of the building where state licensed materials had been used. The area in the northwest corner of the building, which was a section of the old fuel fabrication, was not included in this confirmatory survey. This area now contains office spaces and the telecommunications group. This area will be surveyed at some future date.

Based upon the results of the combined confirmatory surveys, the State of California will release the entire area if the results indicate that the areas can be released for unrestricted use.

3. Procedure

Radiation surveys were conducted in those portions of the Experimental Building where the TRIGA fuel fabrication had been done. The areas surveyed included the floor areas of the second and third floor mezzanines and appropriate floor area sections of the main floor (Figure 1). It was noted that the licensee had scabbled much of the floor areas on the main floor and had dug trenches to effect the removal of drain pipes. The ditches were also surveyed if they were located within the areas where work with NRC licensed materials had been conducted. A 100% gamma survey was conducted on the floor areas with Eberline PRM-7's Serial Numbers 247 and 510 calibrated on 7-21-87 and 7-27-87 respectively. The instruments were held approximately one to two inches from the floor surfaces.

Selected areas of the walls, pipings and conduits located in the areas where work with NRC licensed materials had been conducted were also included in the survey. Contamination surveys were conducted of selected areas within the same above mentioned locations using Eberline E-520's, Serial Numbers 1747 and 2776 calibrated on 6-11-87 and 7-10-87 respectively. The E-520s were equipped with Model HP-260 pancake GM detectors. Also, 14 wipe samples were collected and analyzed (Table 1). The instrument used to analyze the wipes is the NRC Region V Tennelec Model LB5100 low background system.

Three soil samples were collected from selected areas of the ditches which had been dug in the floor areas. A drain pipe located above the floor along the north wall in the area was cut open and the scrapings from the pipe interior were collected. These samples were analyzed at the Radiological and Environmental Sciences Laboratory of the U.S. Department of Energy Idaho Operations Office (see Tables 2 to 5).

4. Discussion and Findings

Radiation surveys conducted indicated the presence of background levels ranging from 15-30 μR/hr. The range is attributed to natural background contributions from the varying amounts of concrete present.

Contamination surveys conducted indicated the presence of two contaminated spots of approximately 15 cm^2 each. One spot located next to a wall support on the west wall in the solvent extraction area had a beta-gamma contamination level of approximately 6000 dpm. Another spot located adjacent to a drain pipe on the north west wall of the building had a beta-gamma contamination level of approximately 3000 dpm. The contamination in each location was removed by the licensee. A resurvey by the NRC inspector indicated that the contamination had been removed.

Wipes collected from 14 locations did not indicate the presence of any significant removable contamination. See Table 1 for the results.

Soil samples collected from three trench locations indicated the presence of less than 1 pCi U-235/g soil in two of the samples and nothing detectable in the third sample (Table 2, 3, 4). These results are well within the NRC guidelines criteria of 30 pCi U-235/g soil for the most insoluble form of U-235. Analyses of the scrapings from the drain pipe also indicated less than 1 pCi U-235/g (Table 5).

5. Conclusions

The portion of the Experimental Building which was examined during the confirmatory survey had been satisfactorily decontaminated by the licensee and is acceptable for release to unrestricted use in accordance with NRC guidelines.

TABLE 1

U. S. Nuclear Regulatory Commission

Region V

Independent Survey Data

Licensee: G.A. Technologies

Date: 8-18-87

By: J. Frank Pang and R. D. Thomas

Sample Number	Location	Contamination Wipes (Alpha) dpm	Contamination Wipes (Beta/Gamma) dpm
1	On top of switch box	6.6	7.7
2	Behind pipe near floor	7.1	17
3	Drain pipe	94	261
4	Behind wall bracket	2.0	4.3
5	Inside channel bracket	10	9.8
6	Inside channel bracket-head level	13	23
7	Inside breaker box	15	21
8	On top of light fixture	14	14
9	Top of switch box	3.2	8.7
10	Ledge of overhead beam	38	42
11	Top of light fixture	41	74
12	On top of sprinkler pipe	13	16
13	Overhead beam	24	34
14	Light switch in small room	1.8	1.2

TABLE 2

```
                         UNITED STATES D[illegible]TMENT OF ENERGY
                               IDAHO OPER[illegible]ONS OFFICE
                 RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY
                                 SAMPLE RECORD SHEET                       SERIAL NO.   14285A

       NRCS
************************
 NRC MOD NO. X?????      *
 INPLANT                 *              URGENT
************************                DATE NEEDED  08/28/87
                                        NONROUTINE

 SAMPLE DATE   08/18/87        SAMPLE SENT  08/18/87              ANALYZED BY: T.S.MORTON, S.GIMPEL
 SAMPLE HOUR   0200 MST        SAMPLE RECEIVED  08/21/87
 ORGANIZATION  NRCS            HARDCOPY PRINTOUT   08/28/87       ORIGINAL SIGNED BY: D.B. MARTIN

 COMMENTS:
 G.A. TECHNOLOGIES SOIL SAMPLE #1.


 COLLECTION DATE:  08/18/87    ANALYSIS DATE:  08/25/87    DECAY TIME    7.4 DAYSA
 COUNT TIME  963 MIN.     DETECTOR NUMBER  1     SAMPLE SIZE  4.74E+02 g

     TOTAL    GROSS     BKGD     MINOR     NET      ISOTOPE            RESULTS +/- 1S;OAA
     COUNT    COUNT     COUNT    COUNT     COUNT
               C/M       C/M      C/M       C/M                             uCi/gram

      2455     2.55      0.13               2.42     Ac 228     ( 1.49 +/- 0.05;0.09 )E -6
       243     0.25                         0.25     CsD137     ( 4.1 +/- 1.0;1.0 )E -8
      9443     9.81      0.60               9.21     K 40       ( 2.17 +/- 0.04;0.09 )E -5
       146     0.15      0.06               0.09     PaM234     ( 2.1 +/- 1.1;1.1 )E -6
     12444    12.92      0.30              12.62     Pb 212     ( 1.72 +/- 0.04;0.09 )E -6
      3786     3.93      0.18               3.75     Pb 214     ( 8.6 +/- 0.3;0.4 )E -7
      2151     2.23      0.30      0.60     1.33     U 235      ( 1.4 +/- 0.2;0.2 )E -7


 * DECAY CORRECTION OF NATURAL CHAIN DAUGHTERS PER LONGEST LIVED PARENT
** ESTIMATED RANDOM UNCERTAINTY REPORTED IS ONE STANDARD DEVIATION, 1S.  SMALL NEGATIVE AND OTHER
   RESULTS LESS THAN OR EQUAL TO 2S ARE INTERPRETED BY RESL AS INCLUDING "ZERO" OR AS NOT DETECTED.
   FOR RESULTS GREATER THAN 2S BUT LESS THAN OR EQUAL TO 3S, DETECTION IS QUESTIONABLE.  RESULTS
   GREATER THAN 3S INDICATE DETECTION.  O IS THE ESTIMATED OVERALL UNCERTAINTY.
```

TABLE 2

UNITED STATES DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE
RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY
SAMPLE RECORD SHEET

SERIAL NO. 14285B

NRCS
****
* NRC MOD NO. X[illegible] *
* INPLANT *
****

URGENT
DATE NEEDED 08/28/87
NONROUTINE

SAMPLE DATE 08/18/87
SAMPLE HOUR 0200 MST
ORGANIZATION NRCS

SAMPLE SENT 08/18/87
SAMPLE RECEIVED 08/21/87
HARDCOPY PRINTOUT 08/28/87

ANALYZED BY: J.S.MORTON, S.GIMPEL

ORIGINAL SIGNED BY: D.B. MARTIN

COMMENTS:
G.A. TECHNOLOGIES SOIL SAMPLE #2.

COLLECTION DATE: 08/18/87 ANALYSIS DATE: 08/25/87 DECAY TIME 7.4 DAYS*
COUNT TIME 963 MIN. DETECTOR NUMBER 3 SAMPLE SIZE 4.99E+02 g

TOTAL COUNT	GROSS COUNT C/M	BKGD COUNT C/M	MINOR COUNT C/M	NET COUNT C/M	ISOTOPE	RESULTS +/- 1S;O** uCi/gram
3278	3.40	0.06		3.34	AC 228	(3.28 +/- 0.09;0.18)E -6
41	0.04			0.04	CsD137	(1.1 +/- 1.5;1.5)E -8
5830	6.05	0.30		5.75	K 40	(2.35 +/- 0.05;0.10)E -5
20244	21.02	0.30		20.72	Pb 212	(3.79 +/- 0.07;0.19)E -6
3756	3.91	0.19		3.72	Pb 214	(1.25 +/- 0.04;0.06)E -6
2022	2.10	0.18	0.72	1.20	U 235	(1.6 +/- 0.2;0.2)E -7

* DECAY CORRECTION OF NATURAL CHAIN DAUGHTERS PER LONGEST LIVED PARENT

** ESTIMATED RANDOM UNCERTAINTY: REPORTED IS ONE STANDARD DEVIATION, 1S. SMALL NEGATIVE AND OTHER RESULTS LESS THAN OR EQUAL TO 2S ARE INTERPRETED BY RESL AS INCLUDING "ZERO" OR AS NOT DETECTED. FOR RESULTS GREATER THAN 2S BUT LESS THAN OR EQUAL TO 3S. DETECTION IS QUESTIONABLE. RESULTS GREATER THAN 3S INDICATE DETECTION. O IS THE ESTIMATED OVERALL UNCERTAINTY.

TABLE 1

UNITED STATES DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE
RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY
SAMPLE RECORD SHEET

SERIAL NO. 14285C

NRCS

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**************************
* NRC MOD NO. X?????     *
* INPLANT                *
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URGENT
DATE NEEDED 08/28/87
NONROUTINE

SAMPLE DATE 08/18/87
SAMPLE HOUR 0200 MST
ORGANIZATION NRCS

SAMPLE SENT 08/18/87
SAMPLE RECEIVED 08/21/87
HARDCOPY PRINTOUT 08/28/87

ANALYZED BY: J.S.MORTON, S.GIMPEL

ORIGINAL SIGNED BY: D.B. MARTIN

COMMENTS:
G.A. TECHNOLOGIES SOIL SAMPLE #3.

COLLECTION DATE: 08/18/87 ANALYSIS DATE: 08/25/87 DECAY TIME 7.4 DAYS*
COUNT TIME 963 MIN. DETECTOR NUMBER 6 SAMPLE SIZE 5.45E+02 g

TOTAL COUNT	GROSS COUNT C/M	BKGD COUNT C/M	MINOR COUNT C/M	NET COUNT C/M	ISOTOPE	RESULTS +/- 1S;O** uCi/gram
2486	2.59	0.06		2.52	Ac 228	(2.49 +/- 0.08;0.14)E -6
41	0.04			0.04	CsD137	(1.1 +/- 0.9;0.9)E -8
4757	4.94	0.06		4.88	K 40	(2.04 +/- 0.04;0.09)E -5
15200	15.78	0.24		15.54	Pb 212	(2.73 +/- 0.05;0.18)E -6
3954	4.11	0.12		3.99	Pb 214	(1.33 +/- 0.04;0.06)E -6

* DECAY CORRECTION OF NATURAL CHAIN DAUGHTERS PER LONGEST LIVED PARENT

** ESTIMATED RANDOM UNCERTAINTY REPORTED IS ONE STANDARD DEVIATION, 1S. SMALL NEGATIVE AND OTHER RESULTS LESS THAN OR EQUAL TO 2S ARE INTERPRETED BY RESL AS INCLUDING "ZERO" OR AS NOT DETECTED. FOR RESULTS GREATER THAN 2S BUT LESS THAN OR EQUAL TO 3S, DETECTION IS QUESTIONABLE. RESULTS GREATER THAN 3S INDICATE DETECTION. O IS THE ESTIMATED OVERALL UNCERTAINTY.

Ta[illegible] 5

UNITED STATES DEPART[illegible] OF ENERGY
IDAHO OPERATIONS OFFICE
RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY
SAMPLE RECORD SHEET

SERIAL NO. 14285D

NRCL

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*************************
 NRC JOB NO. X[illegible]      *            URGENT
 INPLANT                       *            DATE NEEDED  08/28/87
*************************                   NONROUTINE
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SAMPLE DATE 08/18/87 — SAMPLE SENT 08/18/87 — ANALYZED BY: J.S.MORTON, S.GIMPEL
SAMPLE HOUR 0200 MST — SAMPLE RECEIVED 08/21/87
ORGANIZATION NRCS — HARDCOPY PRINTOUT 08/28/87 — ORIGINAL SIGNED BY: D.B. MARTIN

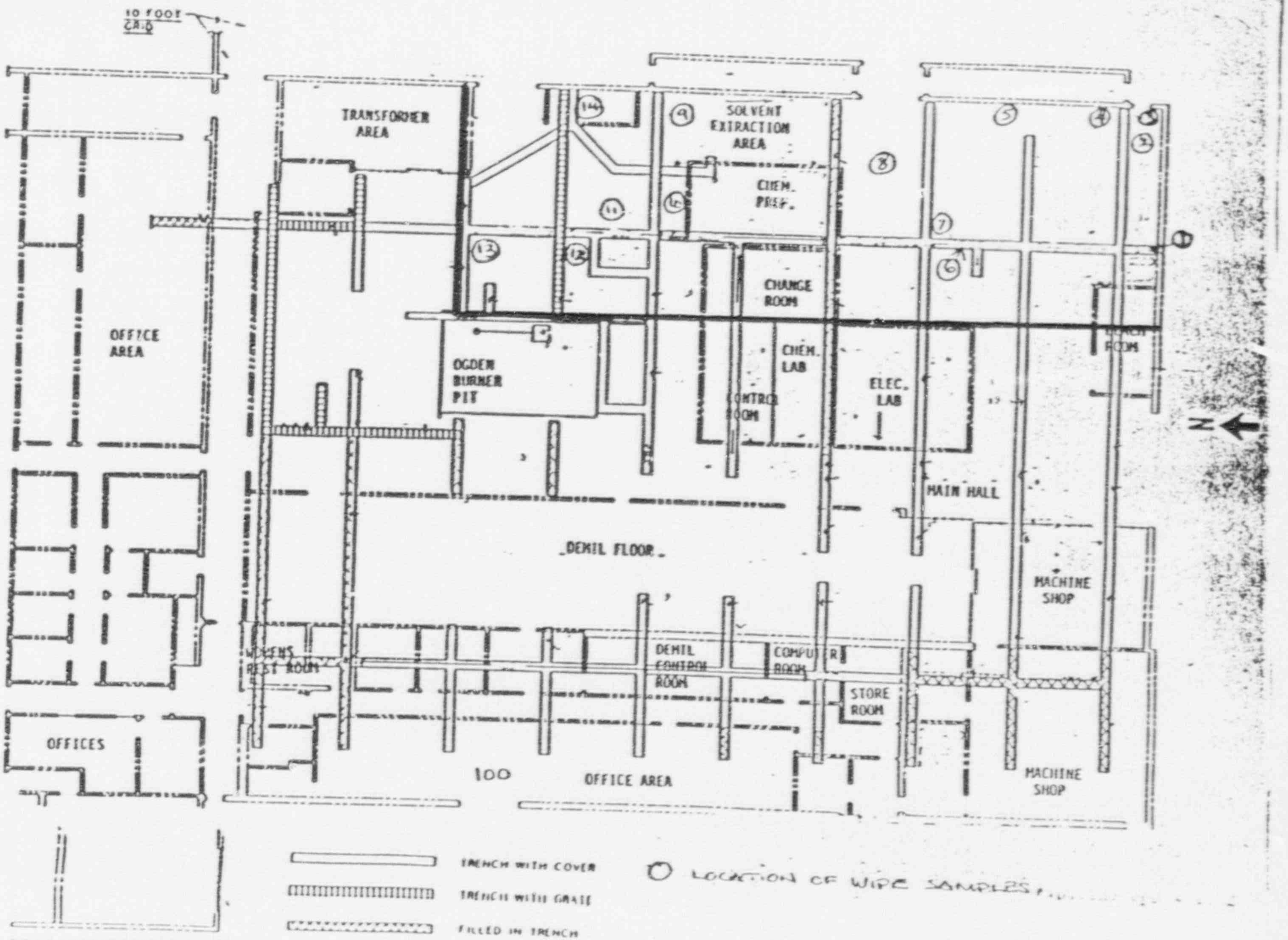
COMMENTS:
G.A. TECHNOLOGIES SAMPLE 04. SCRAPINGS FROM DRAIN PIPE.

COLLECTION DATE: 08/18/87 — ANALYSIS DATE: 08/26/87 — DECAY TIME 8.4 DAYS*
COUNT TIME 933 MIN. — DETECTOR NUMBER 6 — SAMPLE SIZE 2.53E+01 g

TOTAL COUNT	GROSS COUNT C/M	BKGD COUNT C/M	MINOR COUNT C/M	NET COUNT C/M	ISOTOPE	RESULTS +/- 1S;O** uCi/gram
2645	2.78	0.06		2.72	Ac 228	(1.54 +/- 0.04;0.08)E -5
9	0.01			0.01	CsD137	(1.3 +/- 6.2;6.2)E -8
159	0.16	0.06		0.10	K 40	(2.7 +/- 0.6;0.6)E -6
18759	19.68	0.24		19.44	Pb 212	(1.55 +/- 0.03;0.07)E -5
711	0.75	0.18	0.06	0.51	U 235	(2.8 +/- 0.7;0.7)E -7

* DECAY CORRECTION OF NATURAL CHAIN DAUGHTERS PER LONGEST LIVED PARENT

** ESTIMATED RANDOM UNCERTAINTY REPORTED IS ONE STANDARD DEVIATION, 1S. SMALL NEGATIVE AND OTHER RESULTS LESS THAN OR EQUAL TO 2S ARE INTERPRETED BY RESL AS INCLUDING "ZERO" OR AS NOT DETECTED. FOR RESULTS GREATER THAN 2S BUT LESS THAN OR EQUAL TO 3S, DETECTION IS QUESTIONABLE. RESULTS GREATER THAN 3S INDICATE DETECTION. O IS THE ESTIMATED OVERALL UNCERTAINTY.


10 FOOT GRID
N
TRANSFORMER AREA
SOLVENT EXTRACTION AREA
CHEM. PREP.
CHANGE ROOM
CHEM. LAB
CONTROL ROOM
ELEC. LAB
BENCH ROOM
OGDEN BURNER PIT
OFFICE AREA
MAIN HALL
DEMIL FLOOR
MACHINE SHOP
MACHINE SHOP
WOMENS REST ROOM
DEMIL CONTROL ROOM
COMPUTER ROOM
STORE ROOM
OFFICES
100
OFFICE AREA
1
2
3
4
5
6
7
8
9
10
11
12
13
14
TRENCH WITH COVER
TRENCH WITH GRATE
FILLED IN TRENCH
○ LOCATION OF WIPE SAMPLES

FEB 26 1988

Docket No. 70-734

GA Technologies, Inc.
P.O. Box 85608
San Diego, California 92138

Attention: Mr. R. N. Rademacher, Director
Human Resources

Gentlemen:

SUBJECT: INSPECTION AT GA TECHNOLOGIES, INC. (CONFIRMATORY SURVEY)

This refers to a special inspection conducted by Messrs. R. D. Thomas and D. D. Skov of this office on December 14-16, 1987. The inspection consisted of a confirmatory radiological survey of certain areas within the Science Laboratories Building (Building 2) which had been used for NRC licensed activities.

The areas examined during this inspection and the associated findings are described in the enclosed inspection report.

No violations were identified during this inspection.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document Room.

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,

Original signed

James L. Montgomery, Chief
Nuclear Materials Safety and
Safeguards Branch

Enclosure:
Inspection Report No. 70-734/87-15

cc w/enclosure:
Dr. Keith E. Asmussen, Manager
Licensing and Nuclear Material Control
State of California

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 70-734/87-15

Docket No. 70-734

License No. SNM-696

Safeguards Group I

Licensee: GA Technologies, Inc.
P.O. Box 85608
San Diego, California 92138

Facility Name: Science Laboratories Building (Building 2)

Inspection at: Same

Inspection Conducted: December 14 through 16, 198

Inspectors:

R. D. Thomas, Chief
Nuclear Materials Safety Section

2/26/88
Date Signed

David D Skov
D. D. Skov, Radiation Specialist

2/26/88
Date Signed

Approved by: J. L. Montgomery
J. L. Montgomery, Chief
Nuclear Materials Safety and Safeguards Branch

2/26/88
Date Signed

Summary:

Inspection on December 14-16, 1987 (Report No. 70-734/87-15)

A decontamination confirmatory survey was conducted by NRC inspectors of the portions of the Science Laboratories Building (Building 2) in which NRC licensed activities had been conducted. The survey results indicate that the NRC licensed portions have been satisfactorily decontaminated by the licensee. The areas examined under the confirmatory survey are acceptable for release to unrestricted use.

DETAILS

1. Persons Contacted

Keith Asmussen, Manager, Licensing and Nuclear Compliance
Laura Quintana, Manager, Health Physics
Steve Perelman, Staff Health Physics Technician
Robert Dalry, Director, Facilities
Keith Johnson, Manager, Facilities Engineering
Harry Lomax, Construction Planner

2. Introduction

In a letter and accompanying report to NRC Region V dated November 18, 1987, GA Technologies Inc. requested an NRC confirmatory survey of several laboratories within the Laboratory B section of the Science Laboratories Building (Building 2 or "L" Building). The licensee's final report, "Decontamination of Selected GA Technologies' Science Laboratories for Release to Unrestricted Use", indicated that twenty laboratories within the building had been surveyed, and the building decontaminated to levels below the limits required for release to unrestricted use.

On December 10, 1987, the licensee reported by phone that additional areas within Building 2, which had not been included in the GA report, had also been decontaminated and were acceptable for release to unrestricted use. The additional areas identified included four laboratories within Laboratory Sections A and B, and two locations inside the Laboratory Section C service corridor The licensee's decontamination activities with respect to the additional laboratory and service corridor areas were described in the revised GA Technologies' decontamination report to the NRC dated January 18, 1988.

Activities conducted within the various laboratories of Building 2 were authorized by NRC and California State licenses. The confirmatory survey, conducted during the period of December 14 thru 16, 1987, included all Building 2 laboratory areas referenced in the licensee reports. Inspectors from the State of California also performed a confirmatory survey of Building 2 beginning December 17, 1987. The State of California plans to release the Building 2 laboratory areas checked pending the results of the combined confirmatory surveys. The Building 2 complex is shown in Figure 1.

3. Procedure

Radiation surveys were conducted in the following laboratories of Building 2, which the licensee had identified for release to unrestricted use (see Figures 2 thru 4):

Section A Laboratories: 641, 643

Section B Laboratories: 102, 104, 107, 109, 111, 113, 115, 117, 119,
122, 128, 130, 132, 134, 137, 139, 141, 143,
145, 147, 149, 151, 154

Several of the laboratories with separate room numbers identified above were combined into one larger room. Some laboratories also contained an upper level mezzanine which had been occupied previously as either office space or as an additional laboratory area for the use of licensed material. At the time of the confirmatory survey, Rooms 147, 149, 151, and 154 had been released to unrestricted use and were occupied by rental tenants. With the exception of Room 104, all of the remaining rooms included in the confirmatory survey had been vacated by licensee personnel. Most rooms were empty except for such items as laboratory work benches, wall cabinets, fume hoods (Rooms 113, 122, 130-134, 143), drain pipes and ventilation ducts.

Gamma surveys were conducted in the laboratory rooms over nearly all accessible floor areas, including the mezzanine levels. Additional floor scans were also made along the entire hallway providing direct access to the laboratories which were surveyed within Section B of Building 2. The floor scan included one area of Room 141 where concrete had been scabbled by the licensee to remove surface contamination. All gamma scans were made one to two inches above the floor surfaces with Eberline PRM-7 survey meter Serial Numbers 247 and 510, which had been calibrated on 7/21/87 and 7/23/87 respectively.

Selected locations within the various laboratories were also surveyed using Eberline E-520 portable survey meters, Serial Numbers 2120 and 1586, which were calibrated on 10/8/87 and 11/11/87 respectively. The Eberline E-520 instruments, equipped with Model HP-260 pancake GM detectors, were used to define beta-gamma contamination levels. Twenty-five wipe samples were also collected and analyzed for alpha and beta-gamma radioactivity (Table 1). The wipe samples were counted in the NRC Region V Tennelec Model LB5100 Low Background System.

Confirmatory decontamination surveys were also conducted in two areas within the Laboratory Section C service corridor. The licensee had dug a pit about four feet in depth and had scabbled concrete nearby to remove soil and surface contamination from the service area behind Laboratory Room 331. A similar size pit was also observed in the service area behind Laboratory Room 359/361 where the licensee had removed a contaminated floor drain, concrete and soil.

Three soil samples were collected by the inspectors from the two service corridor areas. These samples were analyzed at the Radiological and Environmental Sciences Laboratory (RESL) of the U.S. Department of Energy, Idaho Operations Office (see Tables 2 thru 4). The Region V office received the results of the soil sample analysis on February 4, 1988.

4. Discussion and Findings

Radiation level and contamination surveys indicated the presence of radioactive contamination in four laboratories. In Room 113, an area of less than 15 cm² on the inside of a bench drawer had a beta-gamma contamination level of approximately 33,000 dpm. Also, a small spot on a lead brick left in the same room had beta-gamma contamination of approximately 80,000 dpm. Low level removable beta-gamma contamination was measured from the wipes of both drawer and lead brick. Both the drawer and lead brick were removed by the licensee for disposal.

Beta-gamma radiation levels of up to 6600 dpm were measured from a wall section and adjoining floor covering an area of approximately one to two square feet in Room 128. The wall section and portions of the adjacent floor (tiles and concrete) were removed by the licensee. A resurvey of the wall and floor areas showed the removal of all radioactive contamination.

A small spot of beta-gamma contamination measuring up to 11,600 dpm was also measured on a shelf in a cabinet beneath the fume hood in Room 143. The shelf was removed by the licensee for disposal. Removable beta-gamma contamination of 128 dpm was also measured on the countertop inside the same fume hood; however the contamination level is well below the limit for release to an unrestricted area under NRC guidelines.

The counter top of one bench cabinet on the mezzanine level of Room 641/643 had fixed beta-gamma contamination measuring approximately 100,000 dpm over an area of less than 100 cm². Much lower contamination levels covering about 15 cm² were measured on a small diameter pipe and floor tile behind the cabinet. The pipe section was decontaminated, and the floor tile and portions of the wood bench top were removed by the licensee for disposal. A resurvey of the above areas showed that the contamination had been removed.

Analyses of the soil samples collected from the two service corridor areas indicated that uranium-235 contamination was not detectable.

5. Conclusions

The portions of the Science Laboratory Building which were included in the confirmatory survey had been satisfactorily decontaminated by the licensee and are acceptable for release to unrestricted use in accordance with NRC guidelines.

TABLE 1

Wipe Contamination Survey

Wipe No.	Description of Location	Results in dpm per 100 cm² Alpha	Results in dpm per 100 cm² Beta-Gamma
1	Room 113 - Inside top left drawer of bench cabinet	0	89
2	Room 113 - Lead brick	4	582
3	Room 113 - Hot sink drain	0	5
4	Room 113 - Drain pipe adjacent to fume hood	1	3
5	Room 113 - Inside doorknob of room door	0	4
6	Room 115 - Cabinet benchtop	0	2
7	Room 115 - Handrail in stairway	0	2
8	Room 119 - Sink facet handle	1	1
9	Room 119 - Concrete tabletop	0	2
10	Room 122 - Sink drain	1	3
11	Room 122 - Countertop inside fume hood	1	8
12	Room 122 - Doorknob between rooms 119-122	0	0
13	Room 128 - Wall behind refrigerator (after decontamination)	0	1
14	Room 128 - Floor behind refrigerator (after decontamination)	66	32
15	Room 134 - Sink (ground level)	1	2
16	Room 134 - Fumehood (ground level)	0	8
17	Room 134 - Sink (mezzanine)	0	1
18	Room 134 - Countertop of bench (mezzanine)	0	1
19	Room 143 - Bottom shelf inside fume hood cabinet	1	21
20	Room 143 - Countertop inside fume hood	1	128

TABLE 1

Wipe Contamination Survey

Wipe No.	Description of Location	Results in dpm per 100 cm²	
		Alpha	Beta-Gamma
21	Room 641 - Wall ventilation duct	0	0
22	Room 641 - Benchtop (mezzanine) before decontamination	15	46
23	Room 641 - Benchtop (mezzanine) after decontamination	0	3
24	Room 641 - Sink	3	2
25	Room 641 - Pipe outer surface behind bench (mezzanine) after decontamination	0	0

Table

UNITED STATES DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE
RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY
SAMPLE RECORD SHEET

SERIAL NO. 14387A

NRC5
****
* NRC MOD NO. ??????   *
* INPLANT   *
****

DATE NEEDED 01/11/88
NONROUTINE

SAMPLE DATE 12/14/87
SAMPLE HOUR 1200 MST
ORGANIZATION NRC5

SAMPLE SENT 12/21/87
SAMPLE RECEIVED 12/29/87
HARDCOPY PRINTOUT 01/20/88

ANALYZED BY: J.S.MORTON, S.GIMPEL

ORIGINAL SIGNED BY: D.B. MARTIN

COMMENTS:
NRC; COLLECTED BY D.D. SKO[illegible]; GA TECHNOLOGIES; SOIL FROM AN OPEN PIT, SERVICE CORRIDOR TO RM 359 URANIUM BY GAMMA SCAN)

COLLECTION DATE: 12/14/87 ANALYSIS DATE: 01/06/88 DECAY TIME 23.9 DAYS*
COUNT TIME 60 MIN. DETECTOR NUMBER 6 SAMPLE SIZE 2.81E+02 g

TOTAL COUNT	GROSS COUNT C/M	BKGD COUNT C/M	MINOR COUNT C/M	NET COUNT C/M	ISOTOPE	RESULTS +/- 1S;O** uCi/gram
-4	-0.07			-0.07	Co 60	(-3 +/- 4; 4)E -8
18	0.30			0.30	CsD137	(9 +/- 4; 4)E -8
281	4.68	0.12		4.56	K 40	(2.23 +/- 0.15;0.17)E -5
-4	-0.07			-0.07	PaM234	(-3 +/- 6; 6)E -6
54	0.90	0.24	0.42	0.24	U 235	(3 +/- 6; 6)E -8

* DECAY CORRECTION OF NATURAL CHAIN DAUGHTERS PER LONGEST LIVED PARENT
** ESTIMATED RANDOM UNCERTAINTY REPORTED IS ONE STANDARD DEVIATION, 1S. SMALL NEGATIVE AND OTHER RESULTS LESS THAN OR EQUAL TO 2S ARE INTERPRETED BY RESL AS INCLUDING "ZERO" OR AS NOT DETECTED. FOR RESULTS GREATER THAN 2S BUT LESS THAN OR EQUAL TO 3S, DETECTION IS QUESTIONABLE. RESULTS GREATER THAN 3S INDICATE DETECTION. O IS THE ESTIMATED OVERALL UNCERTAINTY.

Table 3

UNITED STATES DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE
RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY
SAMPLE RECORD SHEET

SERIAL NO. 14387B

NRC5

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****************************
* NRC MOD NO. ??????       *
* INPLANT                  *
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DATE NEEDED 01/11/88
NONROUTINE

SAMPLE DATE 12/14/87
SAMPLE HOUR 1200 MST
ORGANIZATION NRC5

SAMPLE SENT 12/21/87
SAMPLE RECEIVED 12/29/87
HARDCOPY PRINTOUT 01/20/88

ANALYZED BY: J.S.MORTON, S.GIMPEL

ORIGINAL SIGNED BY: D.B. MARTIN

COMMENTS:
NRC; COLLECTED BY D.D. SKOV; GA TECHNOLOGIES; SOIL FROM AN OPEN PIT, SERVICE CORRIDOR TO RM 331; (URANIUM BY GAMMA SCAN)

COLLECTION DATE: 12/14/87 ANALYSIS DATE: 01/06/88 DECAY TIME 25.0 DAYS*
COUNT TIME 60 MIN. DETECTOR NUMBER 6 SAMPLE SIZE 2.92E+02 g

TOTAL COUNT	GROSS COUNT C/M	BKGD COUNT C/M	MINOR COUNT C/M	NET COUNT C/M	ISOTOPE	RESULTS +/- 1S;O** uCi/gram
3	0.05			0.05	Co 60	(2 +/- 4; 4)E -8
0	0.00			0.00	CsD137	(0 +/- 3; 3)E -8
294	4.90	0.12		4.78	K 40	(2.27 +/- 0.15;0.17)E -5
1	0.02			0.02	PaM234	(1 +/- 4; 4)E -6
25	0.42	0.24	0.30	-0.12	U 235	(-2 +/- 6; 6)E -8

* DECAY CORRECTION OF NATURAL CHAIN DAUGHTERS PER LONGEST LIVED PARENT

** ESTIMATED RANDOM UNCERTAINTY REPORTED IS ONE STANDARD DEVIATION, 1S. SMALL NEGATIVE AND OTHER RESULTS LESS THAN OR EQUAL TO 2S ARE INTERPRETED BY RESL AS INCLUDING "ZERO" OR AS NOT DETECTED. FOR RESULTS GREATER THAN 2S BUT LESS THAN OR EQUAL TO 3S, DETECTION IS QUESTIONABLE. RESULTS GREATER THAN 3S INDICATE DETECTION. O IS THE ESTIMATED OVERALL UNCERTAINTY.

UNITED STATES DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE
RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY
SAMPLE RECORD SHEET

SERIAL NO. 14387C

NRC5

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***************************
* NRC MOD NO. ??????      *
* INPLANT                 *
***************************
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DATE NEEDED 01/11/88
NONROUTINE

SAMPLE DATE 12/14/87
SAMPLE HOUR 1200 MST
ORGANIZATION NRC5

SAMPLE SENT 12/21/87
SAMPLE RECEIVED 12/29/87
HARDCOPY PRINTOUT 01/20/88

ANALYZED BY: J.S.MORTON, S.GIMPEL

ORIGINAL SIGNED BY: D.B. MARTIN

COMMENTS:
NRC; COLLECTED BY D.D. SKOV; GA TECHNOLOGIES; SOIL FROM DIRT PILE, SERVICE CORRIDOR TO RM 331; (URANIUM BY GAMMA SCAN)

COLLECTION DATE: 12/14/87 ANALYSIS DATE: 01/07/88 DECAY TIME 24.9 DAYS*
COUNT TIME 60 MIN. DETECTOR NUMBER 6 SAMPLE SIZE 2.90E+02 g

TOTAL COUNT	GROSS COUNT C/M	BKGD COUNT C/M	MINOR COUNT C/M	NET COUNT C/M	ISOTOPE	RESULTS +/- 1S;O** uCi/gram
0	0.00			0.00	Co 60	(0 +/- 5; 5)E -8
-9	-0.15			-0.15	CsD137	(-4 +/- 4; 4)E -8
271	4.52	0.12		4.40	K 40	(2.09 +/- 0.14;0.16)E -5
-1	-0.02			-0.02	PaM234	(0 +/- 6; 6)E -6
57	0.95	0.24	0.23	0.48	U 235	(6 +/- 5; 5)E -8

* DECAY CORRECTION OF NATURAL CHAIN DAUGHTERS PER LONGEST LIVED PARENT
** ESTIMATED RANDOM UNCERTAINTY REPORTED IS ONE STANDARD DEVIATION, 1S. SMALL NEGATIVE AND OTHER RESULTS LESS THAN OR EQUAL TO 2S ARE INTERPRETED BY RESL AS INCLUDING "ZERO" OR AS NOT DETECTED. FOR RESULTS GREATER THAN 2S BUT LESS THAN OR EQUAL TO 3S, DETECTION IS QUESTIONABLE. RESULTS GREATER THAN 3S INDICATE DETECTION. O IS THE ESTIMATED OVERALL UNCERTAINTY.

Figure 1

Building 2 Complex (Science Laboratories Building)

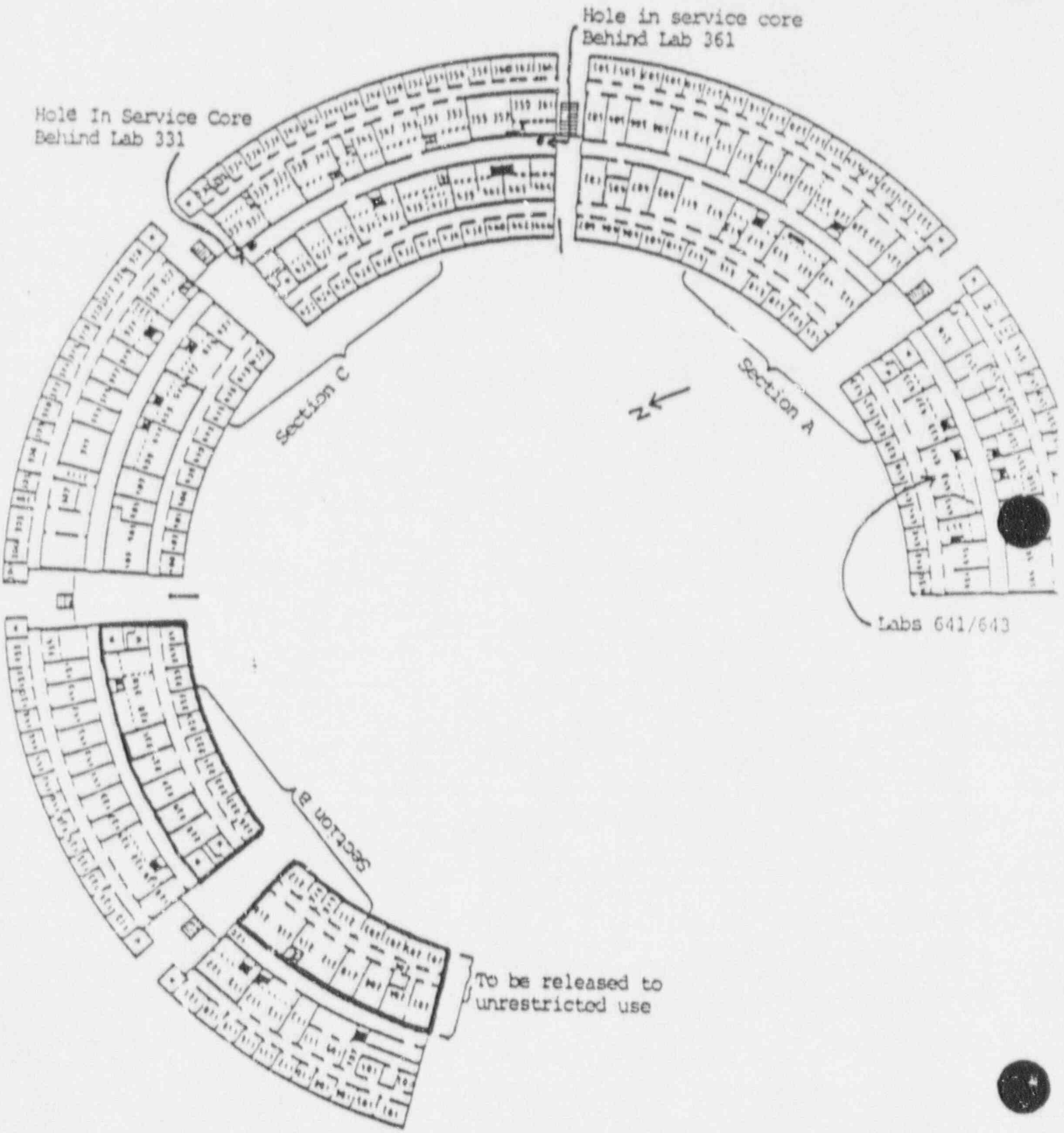

Figure 2

Laboratory Section A

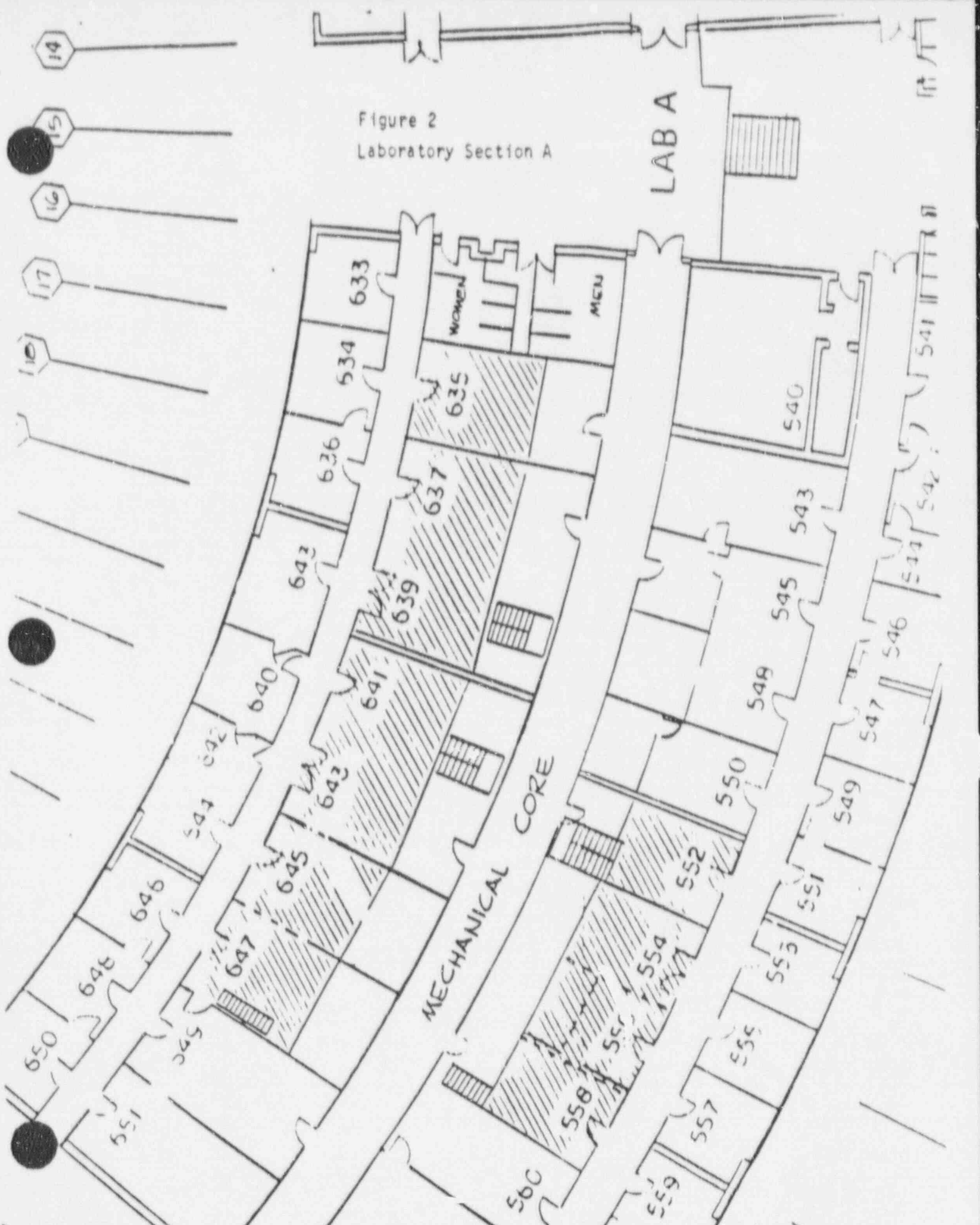

Figure 3a

Laboratory Section B

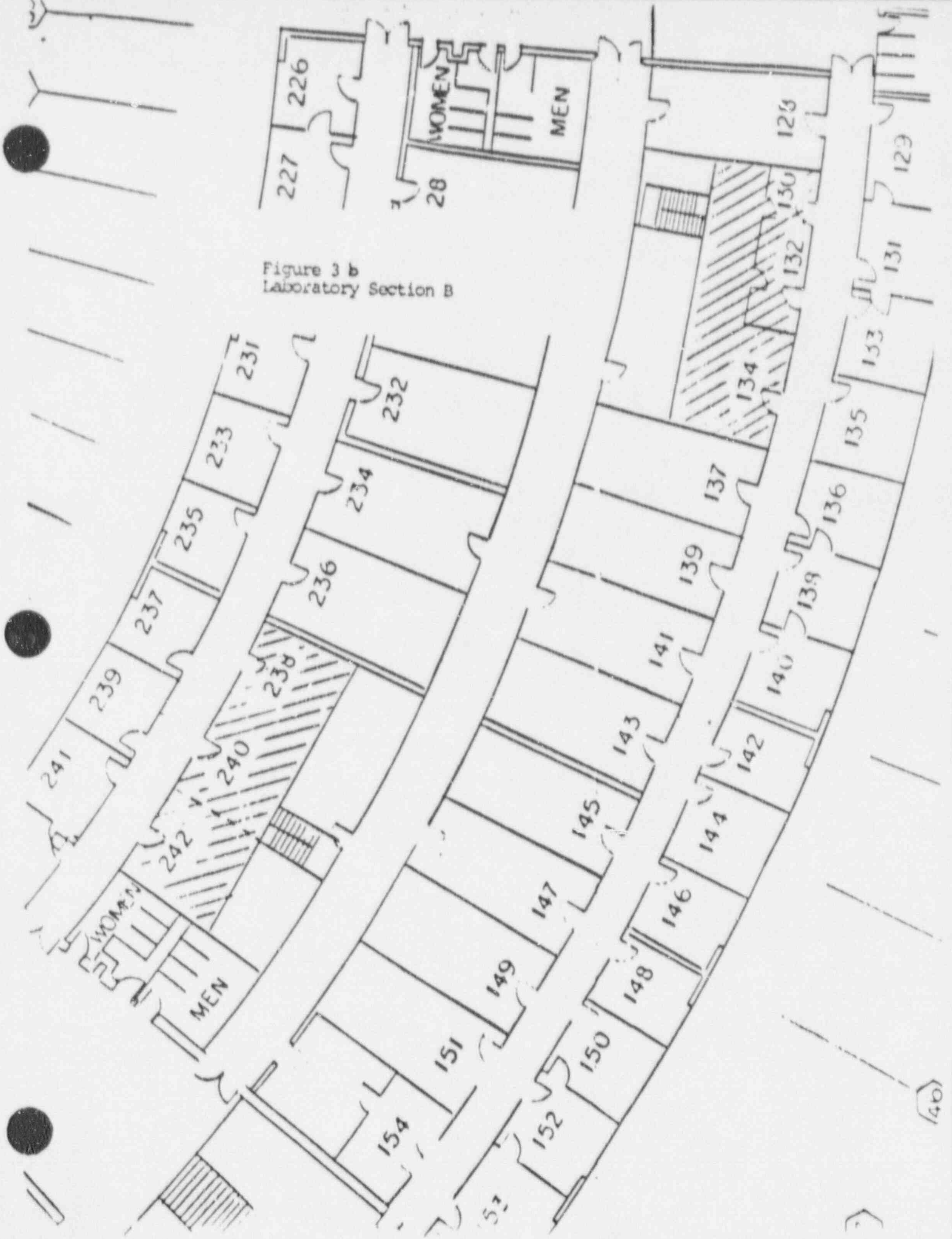

Figure 3 b
Laboratory Section B

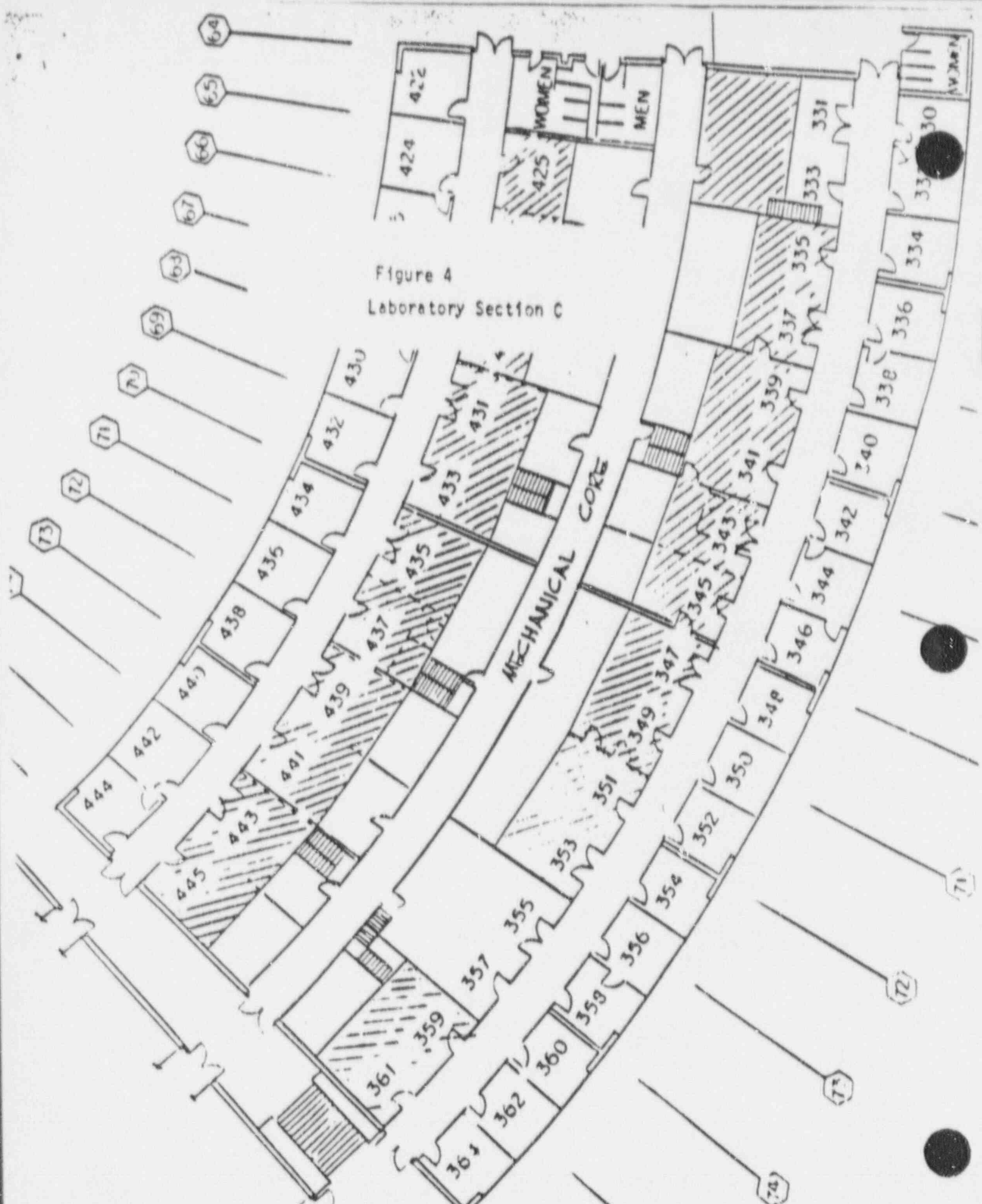

Figure 4
Laboratory Section C

AUG 18 1989

Docket No. 70-734

General Atomics
P. O. Box 85608
San Diego, California 92138

Attention: Mr. R. N. Rademacher, Vice President,
Human Resources

Gentlemen:

SUBJECT: NRC INSPECTION

This letter concerns the confirmatory surveys of certain General Atomics facilities conducted by Oak Ridge Associate Universities (ORAU) under NRC contract on March 14-23, 1989. These were areas where activities authorized by NRC license No. SNM-696 had previously taken place.

Based on our review of ORAU's Final Report, ORAU 89/F-98, dated July 1989, the areas surveyed appear to meet the criteria of Annex C, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-product, Source or Special Nuclear Material", dated July 1982, as required by License Condition No. 25. The enclosed ORAU report is being identified as NRC Inspection Report No. 70-734/89-02.

Additional correspondence regarding the release of these areas can be expected from the NRC's Fuel Cycle Safety Branch, Division of Industrial and Medical Nuclear Safety, NMSS.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the enclosure will be placed in the NRC's Public Document Room.

Should you have any questions concerning this inspection, we will ' glad to discuss them with you.

Sincerely,

Gregory P. Yuhas, Chief
Emergency Preparedness and
Radiological Protection Branch

Enclosure:
ORAU 89/F-98 Final Report
(NRC Report No. 70-734/89-02)

1/1

cc w/enclosure:
Dr. K. E. Asmussen, Manager,
Licensing, Safety and Nuclear Compliance
John H. Hickman, Department of Health Services
State of CA

NOTE: A copy of the ORAU report is in Attachment "ORAU Reports"

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CALIFORNIA 94596

AUG 22 1989

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

FROM: Gregory P. Yuhas, Chief
Emergency Preparedness and
Radiological Protection Branch

SUBJECT: RELEASE OF GENE[illegible]OMICS FACILITIES FOR UNRESTRICTED USE, DOCKET [illegible], LICENSE SNM-696

By letters dated December 21, 1[illegible] and January 30, 1989, and facsimile dated February 28, 1989, to the Regional Office, General Atomics (GA) requested that certain facilities previously used under their SNM-696 license be released for unrestricted use. The letters and facsimile also contained GA's final radiation and contamination surveys for these areas. These documents have been previously provided to your office.

Under NRC's contract, Oak Ridge Associate Universities (ORAU) performed confirmatory surveys of these facilities during March 14-23, 1989. The results of these surveys are documented in an ORAU Final Report, ORAU 89/F-89, dated July 1989, which was also sent to your office. Region V sent copies of the ORAU report to the licensee by letter dated August 18, 1989. The ORAU report has been designated (NRC) Inspection Report No. 70-734/89-02.

Based on the licensee's surveys and the results of the confirmatory surveys conducted by ORAU, we recommend that these facilities be released for unrestricted use.

If you need any further information please contact Ray Fish, Chief, Emergency Preparedness Section, FTS 463-3761.

G. P. Yuhas

Gregory P. Yuhas, Chief
Emergency Preparedness and
Radiological Protection Branch

cc: Docket File
J. Martin
B. Faulkenberry
M. Smith
G. Cook
G. Bidinger, NMSS

FEB 1 6 1990

Docket No. 70-734

General Atomics
P. O. Box 85608
San Diego, California 92138

Attention: Mr. R. N. Rademacher, Vice President,
Human Resources

Gentlemen:

Subject: NRC Inspection

This letter concerns the confirmatory surveys of certain General Atomics facilities conducted by Oak Ridge Associate Universities (ORAU) under NRC contract on October 9-12, 1989, and subsequent follow-up of certain surveys conducted by the State of California, Department of Health Services Radiological Health Branch on October 25, 1989. These were areas where activities authorized by NRC license No. SNM-696 had previously taken place.

Based on our review of ORAU's Final Report, ORAU 90/A-102, dated January 1990, the areas surveyed appear to meet the criteria of Annex C, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-product, Source or Special Nuclear Material", dated July 1982, as required by License Condition No. 25. The enclosed ORAU report is also being identified as NRC Inspection Report No. 70-734/90-01.

Additional correspondence regarding the releases of these areas can be expected from the NRC's Fuel Cycle Safety Branch, Division of Industrial and Medical Nuclear Safety, NMSS.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the enclosure will be placed in the NRC's Public Document Room.

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,

Original signed

G. P. Yuhas, Chief
Emergency Preparedness and
Radiological Protection Branch

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CALIFORNIA 94596

FEB 16 1990

MEMORANDUM FOR: Glen L. Sjoblom, Acting Chief
Fuel Cycle Safety Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

FROM: Gregory P. Yuhas, Chief
Emergency Preparedness and
Radiological Protection Branch

SUBJECT: RELEASE OF GENERAL ATOMICS FACILITIES FOR UNRESTRICTED USE, DOCKET 70-734, LICENSE SNM-696

By letters dated August 31 and September 13, 1989, General Atomics (GA) requested that certain facilities previously used under their SNM-696 License be released for unrestricted use. The letters also contained GA's final radiation and contamination surveys for the respective areas requested for release. These documents have been previously provided to your office.

Under NRC's contract, Oak Ridge Associate Universities (ORAU) performed confirmatory surveys of these facilities during October 9-12, 1989. The results of these surveys, and those performed by the State of California are documented in ORAU's Final Report, ORAU, 90/A-102, dated January 1990, which also have been sent to your office. Region V sent copies of the ORAU report to the licensee by letter dated February 16, 1990. The ORAU report has been documented as NRC Inspection Report No. 70-734/90-01.

Based on the licensee's surveys an the results of the confirmatory surveys conducted by ORAU, we recommend that these facilities be released for unrestricted use.

If you need any further information please contact C. A. Hooker, Fuel Facilities Inspector, FTS 463-3784.

G. P. Yuhas
Gregory P. Yuhas, Chief
Emergency Preparedness and
Radiological Protection Branch

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Enclosure:
ORAU 90/A-102 Final Report (NRC Inspection Report No. 70-734/90-01)

cc w/enclosure:
Dr. K. E. Asmussen, Manager,
Licensing, Safety and Nuclear Compliance
John H. Hickman, Senior Health Physicist
Environmental Radiation Management

NOTE: A copy of the ORAU report is in Attachment "ORAU Reports"