

NRC FORM 313
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10 CFR 30, 32, 33,
34, 35, 36, 39, and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0120

EXPIRES: 10/31/2008

Estimated burden per response to comply with this mandatory collection request: 4.4 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

APPLICATION FOR MATERIAL LICENSE

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, MISSISSIPPI, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
DIVISION OF NUCLEAR MATERIALS SAFETY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

NMSB2

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-4005

03001128

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR (Check appropriate item)

- A. NEW LICENSE
- B. AMENDMENT TO LICENSE NUMBER _____
- C. RENEWAL OF LICENSE NUMBER 45-13147-01

2. NAME AND MAILING ADDRESS OF APPLICANT (Include ZIP code)

George Mason University
Office of Vice President for Research
4400 University Drive
Fairfax, VA 22030-4444

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

George Mason University, 4400 University Drive, Fairfax, Virginia 22030-4444 and 10900 University Boulevard, Manassas, Virginia 20110.

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Diann Stedman

TELEPHONE NUMBER

(703) 993-4820

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSE FEES (See 10 CFR 170 and Section 170.31)

FEE CATEGORY AMOUNT ENCLOSED \$

13. CERTIFICATION. (Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39, AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER - TYPED/PRINTED NAME AND TITLE

SIGNATURE

DATE

Matthew J. Kluger Vice Pres. for Research

Matthew J. Kluger

12/21/05

FOR NRC USE ONLY

TYPE OF FEE FEE LOG FEE CATEGORY AMOUNT RECEIVED CHECK NUMBER COMMENTS

APPROVED BY

DATE

NRC Form 313

1. APPLICATION FOR LICENSE RENEWAL

License # 45-13147-01

2. NAME AND MAILING ADDRESS OF APPLICANT

Office of Vice President for Research
4400 University Drive
Fairfax, VA 22030-4444

3. ADDRESSES WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

George Mason University, 4400 University Drive, Fairfax, Virginia 22030-4444
George Mason University, 10900 University Boulevard, Manassas, Virginia 20110.

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Diann Stedman - (703) 993-4820

5. RADIOACTIVE MATERIAL

As specified in Section 33.100, Schedule A of 10 CFR 33, any materials that have a half life equal to or less than 120 days (Type B Broad license) and the following material with a half life greater than 120 days:

| Radioactive Material | Chemical and/or physical form | Maximum Possession Limit (Ci) |
|----------------------|-------------------------------|-------------------------------|
| Carbon 14 | Any | 0.075 |
| Cesium 137 | Sealed Source | 0.008 |
| Hydrogen 3 | Any | 0.075 |
| Iron 55 | Any | 0.016 |
| Nickel 63 | Sealed Source | 0.09 |

6. PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED

The radioactive material limits listed in item 5.0 will be used in research and development as defined in 10 CFR 30.4.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM, THEIR TRAINING, AND EXPERIENCE

The Radiation Safety Officer (RSO) for this license is Ms. Diann Stedman. Ms. Stedman has been serving as the RSO for this license since January, 2005.

The RSO reports to the Director of Laboratory Safety, who reports to the Vice President for Research. Additional information concerning the administration of the Radiation Health and Safety Program is provided in Section 10. Administrative organizational charts are included in Section 10 and in Attachment 1 to this application.

A copy of training and experience for Ms. Stedman is provided as Attachment 2.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS

8.1 Training for individuals handling radioactive materials in restricted areas will be in accordance with 10 CFR 19.12. This includes training in radiation fundamentals, health risks associated with occupational radiation exposure, emergency procedures, methods for maintaining radiation exposures As Low As Reasonably Achievable (ALARA), reporting violations and obtaining exposure reports. GMU may accept appropriate radiation safety training completed at a previous employer. The training program will generally follow the recommendations in NUREG 1556, Vol. 7, Appendix J. The course content will be customized to meet the needs of GMU and may change as necessary to meet the goals of the radiation safety program.

8.2 Instructions to Ancillary Personnel frequenting restricted areas.

8.2.1 All personnel visiting or frequenting any portion of the restricted area will receive instructions concerning the hazards of the area, accident and emergency procedures, and their responsibility to report violations.

8.2.2 The extent of this instruction shall be commensurate with potential radiological health protection hazards in the restricted area.

8.3 Individuals working in or frequenting restricted areas will complete additional site-specific training.

8.4 Training for individuals working in restricted areas may be completed in varying formats such as, but not limited to, classroom presentation, computer or internet-based training, videos, and/or review of procedural manuals.

- 8.5 Refresher training will be conducted annually for workers when significant changes to the radiation safety program warrant updating staff of new requirements. Refresher training will be conducted annually for those individuals who, in the course of employment, are likely to receive in a year an occupational dose in excess of 100 mrem (1 mSv).

9. FACILITIES AND EQUIPMENT

Radioactive materials will be used in research laboratories or in instructional laboratories and training rooms as part of courses offered by the University. The RSO will approve all areas in which radioactive materials are used or stored. Examples of areas currently using or storing radioactive materials (including waste) are provided in Attachment 3.

GMU has a number of portable and laboratory instruments for measuring radiation. Examples of portable devices currently available include Ludlum model 3, Ludlum model 3-6, Victoreen model 493, and others. Instruments are typically equipped with pancake-type or end-window Geiger-Müller probes or NaI probes for measuring contamination levels. Others may be used for monitoring radiation dose or exposure rates. GMU reserves the right to replace any of the equipment with other makes and models of radiation detectors as needed. Portable radiation survey meters used in laboratories are calibrated at least annually by an outside, licensed firm. The RSO will maintain copies of all records of instrument calibration.

GMU also has a Beckman LS6500 liquid scintillation counter and a Packard Tri-Carb 2100TR liquid scintillation counter. These units are used for counting radioactive samples and for wipe test analysis. GMU will maintain at least one operational liquid scintillation counter at each campus location where radioactive materials are used. Each liquid scintillation counter has a service contract with the respective manufacturer, and is routinely calibrated.

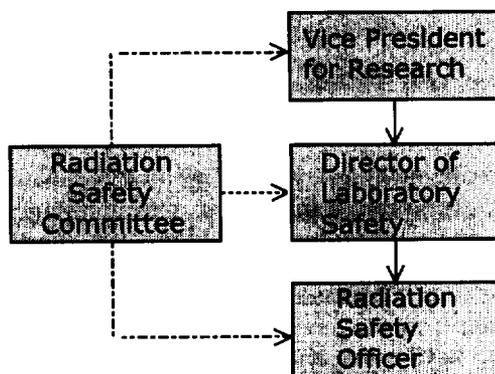
Safety equipment available for individual use includes gloves, lab coats, mechanical pipetting devices, lucite shields, and fume hoods (in the event volatile or potentially volatile radioactive materials are used). Tongs (and other devices) are available for operations which require remote handling.

The laboratories in which radioactive materials are used are standard biology, chemistry, and physics laboratories or training rooms. Essentially all radioactive materials work is confined to designated rooms that have all equipment necessary for use, quantitation, storage, and disposal of radioactive materials. Benchtops are covered with plastic or metal spill trays, plastic-backed absorbent paper, or other protective material when unsealed radioactive materials are used.

Lead and lucite or plastic shields are used in some locations to store radioactive sources. Sources are locked when not in use to prevent theft or unauthorized access.

10. RADIATION SAFETY PROGRAM

10.1 Organization and Control of Radiation Safety Program – Administration of the Radiation Health and Safety Program is achieved through the cooperative efforts of the Vice President for Research, the RSO, the Office of Laboratory Safety, and the Radiation Safety Committee. The Vice President for Research oversees the Radiation Health and Safety Program and represents executive management of the University. The RSO manages the Program and reports to the Director of Laboratory Safety. The Office of Laboratory Safety develops policies and procedures regarding all aspects of laboratory safety, including radiation health and safety. The Radiation Safety Committee reviews the Radiation Health and Safety Program and provides support and guidance to the Vice President for Research, the RSO, and the Office of Laboratory Safety.



GMU has three classifications of Radiation Users: Approved Users, Supervised Users and Student Users. Approved Users exercise on-site control of radioactive material. Supervised Users are authorized to use radioactive materials for research or instruction under the supervision of an approved user. Student Users are individuals who work with radioactive materials in a limited capacity and under the supervision of an Approved User or Supervised User as part of an instructional course in which they are enrolled.

- 10.1.1 Radioactive material is to be used only by Approved Users, Supervised Users, and Student Users as authorized by the RSO. Supervised Users and Student Users may use radioactive material only under the supervision of an Approved User. All Users and uses of radioactive materials must be approved by the RSO. Radioactive material may only be used in areas or rooms authorized by the RSO. All designated usage areas must be approved by the RSO.
- 10.1.2 Approved Users. Approved Users are allowed to order radioactive materials. These orders are pre-approved by the RSO. Approved Users are responsible for the safe use of radioactive materials, and for assuring that individuals using the materials have had proper training, received approval from the RSO to use radioactive materials, and follow established procedures for the safe use and disposal of radioactive materials. The Approved User shall comply with all requests from the RSO regarding radiation safety, the GMU Radiation Health and Safety Program, and license conditions. Responsibilities of Approved Users are outlined in Section 10.4 and 10.5.
- 10.1.3 Radiation Users. These are radioactive material users, including Approved Users, Supervised Users, and Student Users that perform the actual operations with radioactive material. Responsibilities of Radiation Users are outlined in Section 10.5.
- 10.1.4 Radiation Safety Officer. The RSO performs those functions outlined in Section 10.2. The RSO is charged with the supervision, and implementation of the Radiation Health and Safety Program.
- 10.1.5 Radiation Safety Committee. The Radiation Safety Committee reviews the implementation and management of the Radiation Health and Safety Program and reviews and recommends for approval, as appropriate, all requests for Approved User status and all projects involving radioactive material.
- 10.2 Responsibilities of the RSO – The primary responsibility of the RSO is to implement the Radiation Health and Safety Program with the assistance and support of executive management and the Radiation Safety Committee. The highest priority for the RSO is to ensure that day-to-day operations involving radioactive material are conducted according to policies and procedures designed to adequately protect public health and safety and maintain exposures ALARA, and are in compliance with all regulatory requirements. If the RSO discovers an activity involving

radioactive material or radiation producing instruments in which health and safety appear to be *compromised to an unacceptable level*, the RSO has the authority to terminate the unsafe activity immediately. The RSO is responsible for conducting or arranging for the following activities to be carried out under the RSO's direction. The RSO may contract for these services, as necessary and appropriate.

- 10.2.1 Review and approve designation of use areas and all protocols for use of radioactive material based on recommendations of the Radiation Safety Committee
- 10.2.2 Perform general surveillance of all health physics activities, including personnel and environmental monitoring
- 10.2.3 Furnish consulting services to personnel at all levels of responsibility on all aspects of radiation protection
- 10.2.4 Authorize procurement, receipt, and distribution of all radioactive material
- 10.2.5 Distribute, receive, and process dosimeters including the maintenance of records, and appropriate notification to individuals and supervisors
- 10.2.6 Provide training for all radioactive material users, including Approved and Supervised Users.
- 10.2.7 Supervise and coordinate radioactive waste disposal, including the maintenance of waste storage and disposal records
- 10.2.8 Maintain an active inventory of all radioactive materials, including amounts, radionuclides and storage/use locations
- 10.2.9 Provide supervision and assistance for the management of emergency, accident, spill or exposure situations
- 10.2.10 Formulate policies and procedures for the control of radiation and radioactive material
- 10.2.11 Prepare all license revisions and amendments
- 10.2.12 Perform or contract for bioassay procedures as necessary

- 10.2.13 Conduct semiannual health physics surveys of all laboratories or areas where radioactive materials are used or stored, document the results of these surveys, and maintain these records on file.
- 10.2.14 Assure radiation detection instruments are calibrated annually.
- 10.2.15 Conduct an annual audit of the radiation safety program content and implementation.
- 10.3 Responsibilities of the Radiation Safety Committee – The activities of the Radiation Safety Committee are those appropriate to accomplish its role in advising the Office of Laboratory Safety and the Vice President for Research with regard to users and uses of ionizing radiation at Mason, and in monitoring and recommending as necessary, modifications to Mason's Radiation Health and Safety Program. Responsibilities of the Committee are to:
 - 10.3.1 Provide guidance to the Office of Laboratory Safety on the development of policies and procedures concerning the use of sources of ionizing radiation in instructional and research laboratories and periodically review these policies and procedures with regard to the needs of the Radiation Health and Safety Program and the current regulations governing the use of radioactive material.
 - 10.3.2 Review all applications for Approved User status and research projects involving sources of ionizing radiation and make recommendations to the RSO regarding their approval.
 - 10.3.3 Routinely review the content and implementation of the Radiation Health and Safety Program and recommend procedural changes to ensure that the program is adequate to meet the needs of radiation users and is consistent with the GMU's written policies and procedures concerning the use of sources of ionizing radiation in instructional and research laboratories and regulations set forth by the NRC.
 - 10.3.4 Recommend appropriate sanctions for any individual whom it determines has violated the terms of an approved radiation project, has conducted radiation projects without proper approval, or has otherwise violated any provision of applicable federal, state, and local regulations and guidelines, or institutional policies and procedures regarding subjects under its purview.

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- 10.4 Responsibilities of Approved Users – As supervisors of laboratories in which sources of ionizing radiation are used, Approved Users have responsibilities that include the following:
- 10.4.1 Obtain prior approval for all research and instructional projects involving sources of ionizing radiation
 - 10.4.2 Provide specific radiation safety training to those individuals for whom they are responsible. Instruct personnel in the use of safe techniques and in the application of approved radiation safety practices, and assure that no personnel are permitted to work with radioactive materials until they have completed required radiation safety training
 - 10.4.3 Provide direct supervision of inexperienced personnel handling radioactive materials during their initial experiments. Initial experiments by inexperienced personnel should be performed with minimal amounts of radioactivity
 - 10.4.4 Take appropriate measures to keep all employee exposures to radiation ALARA
 - 10.4.5 Provide access to adequate instrumentation for assessing potential radiation exposures in the laboratory and performing routine surveys of the work area as necessary, and as required.
 - 10.4.6 Require laboratory personnel to follow the policies and procedures outlined in the Radiation Health and Safety Program and to use recommended safety procedures when working with radioactive materials.
 - 10.4.7 Comply with proper procedures for termination of employment or termination of any project using radioactive materials
 - 10.4.8 Assure that radioactive materials are not acquired or transferred within or outside of GMU without first notifying the RSO
 - 10.4.9 Maintain radioactive material releases to the environment (sewer disposal, airborne releases, etc.) within current GMU guidelines.
 - 10.4.10 Keep laboratory personnel informed of current radiation safety issues, new policies, and changes in requirements

- 10.4.11 Contact the RSO when any of the conditions specified in 10.3.12.1 to 10.3.12.9 are met:
- 10.4.11.1 Pregnancy is declared by a Radiation I User in the laboratory
 - 10.4.11.2 GMU students under the age of 18 are involved with experiments using radioactive material
 - 10.4.11.3 There are renovations, alterations, or radioactive use equipment maintenance functions that need to be performed by Physical Plant or outside vendors (for example, the removal of a radiochemical fume hood)
 - 10.4.11.4 Changing location, planning long absences from GMU, or leaving GMU
 - 10.4.11.5 There are major changes in operational procedures, new techniques, or use of different isotopes
 - 10.4.11.6 New operations are anticipated which might lead to personnel exposures
 - 10.4.11.7 Contamination is detected on laboratory personnel or their clothing
 - 10.4.11.8 Transfer of radioactive material or instruments containing radioactive material between users at GMU or with another Institution are planned
- 10.4.12 Comply with RSO requirements pertaining to documentation of all radioactive waste disposal actions within the laboratory and assure that appropriate records of radioactive waste are maintained. The Approved User is responsible for safe and proper storage of all radioactive waste until it is removed from the laboratory by the RSO

Deleted:

10.5 Responsibilities of the Radiation Users –

- 10.5.1 Radiation Users (Approved Users, Supervised Users, and Student Users) must complete the following requirements before entering into work with radioactive material or working in a radiation area:

- 10.5.1.1 Administrative processing and receipt of a dosimeter (if required for the work to be performed or the work area).
 - 10.5.1.2 Materials and formal training in radiation safety fundamentals commensurate with the type of work to be performed prior to starting work with radioactive material if the person has not had it elsewhere.
 - 10.5.1.3 Pre-employment bioassay procedures, if required.
 - 10.5.1.4 Instruction in GMU procedures in the use and disposal of radioisotopes provided by the RSO, Approved User, or designate.
- 10.5.2 Radiation Users working with sources of radioactive material must adhere to the following procedures:
- 10.5.2.1 Take measures to keep exposures to ionizing radiation to levels ALARA.
 - 10.5.2.2 Wear prescribed monitoring equipment, such as dosimeters, when working with radioactive materials or when in radiation areas.
 - 10.5.2.3 Survey hands and clothing for radioactive contamination after work with unsealed radioactive materials and before leaving the radiation usage area where contamination is possible (except for use of ^3H only).
 - 10.5.2.4 Follow all Radiation Safety and Emergency Procedures listed in 10.10.
 - 10.5.2.5 For all work with unsealed sources, check the immediate areas, e.g., hoods, benches, etc., in which radioactive materials are being used at least once daily for contamination during the day that radioactive materials are used. Uncontrolled contamination must be cleaned immediately. Record this monitoring in the log book. The RSO will provide assistance and/or advice for decontamination procedures.
 - 10.5.2.6 Users may request RSO supervision of any emergency repair of contaminated equipment in the laboratory by shop personnel or by commercial service contractor. At

no time shall servicing personnel be permitted to work on equipment in radioactive material use areas without the presence of an end user to provide specific information.

- 10.5.2.7 Immediately report accidental inhalation, ingestion, or injury involving radioactive materials to the Approved User and the RSO, and carry out their recommended corrective measure. The individual shall cooperate in any and all reasonable attempts to evaluate his exposure.
 - 10.5.2.8 Carry out decontamination procedures when necessary, and take the necessary steps to prevent the spread of contamination to other areas.
 - 10.5.2.9 Comply with requests from the RSO for bioassay measurements and the submission of urine samples for radioassay. Requests for these tests will be made in the case of workers using significant quantities of both gamma and beta emitters.
- 10.6 Audits – GMU shall periodically (at least annually) review the Radiation Health and Safety Program content and implementation. The audit will be conducted by the RSO, outside consultant, or other appropriately qualified individual. The audit format will generally follow the guidance recommended in NUREG 1556, Vol. 7, Appendix L. Records of audits shall be maintained by the RSO for at least three years. The purpose of the audit is to ensure compliance with NRC and DOT regulations (as applicable), the terms and conditions of the license, and that occupational doses and doses to members of the public are ALARA (10 CFR 20.1101).
- 10.7 Radiation Instruments – Instruments used by GMU are described in section 9, "Facilities and Equipment".
- 10.8 Material Receipt and Accountability – Procurement, Package Receipt, and Inventory Procedures.
- 10.8.1 Only the RSO or Approved Users will order and purchase radioactive materials.
 - 10.8.2 The RSO will approve all orders of radioactive materials. The RSO will ensure that the additions to inventory will be within permissible license limits. The RSO shall approve any delivery of radioactive materials to GMU made through a loan, surplus,

gift, or other transfer without purchase through an outside vendor or supplier.

- 10.8.3 Radioactive material packages will be accepted only during normal business day working hours.
- 10.8.4 The RSO, Approved Users, or other personnel trained and approved for radioactive material package receipt will inspect packages upon delivery.
- 10.8.5 The person receiving and inspecting the package will monitor and wipe test packages as required by 10 CFR §20.1906. Packages labeled with White-1, Yellow-II or Yellow-III "Radioactive labels" will be inspected for external package contamination by taking a wipe test sample. The wipe sample must cover at least 300 cm².
- 10.8.6 If any package containing radioactive material arrives damaged (e.g. crushed, wet, leaking), the package must be checked for external contamination and external dose rates. The RSO shall be immediately notified if any package is delivered and it appears to be damaged. Dose rate surveys will be made with an appropriately calibrated instrument.
- 10.8.7 GMU shall immediately notify the final delivery carrier and the NRC Operations Center (301-816-5100), by telephone, if any of the conditions stated in 10.8.7.1 or 10.8.7.2 are met.
 - 10.8.7.1 Removable radioactive surface contamination on the exterior of the package exceeds the limits specified in 49 CFR 173.443 (220 dpm/cm² when averaged over 300 cm²), or
 - 10.8.7.2 External radiation levels exceed the limits of 10 CFR §71.47.
- 10.8.8 Records of all package surveys, if required, will be maintained by the RSO or person conducting the inspection.
- 10.8.9 The RSO will assure that required Inventory Record forms are maintained.
- 10.8.10 Approved Users shall be responsible for maintaining records of radioactive materials they receive and use. Records shall show

the amount received, used, disposed, and in storage, including amounts in radioactive waste.

- 10.8.11 An annual inventory of unsealed radioactive materials shall be conducted. The RSO may conduct the inventory. Alternatively, Approved Users may conduct the inventory and report the results to the RSO.
 - 10.8.12 Physical inventories will be conducted at intervals not to exceed 6 months, to account for all sealed sources and devices received and possessed under the license.
 - 10.8.13 Transfers of radioactive materials from one Approved User to another may occur. The RSO shall be notified when such transfers occur.
 - 10.8.14 The RSO shall approve all transfers of radioactive material or devices containing radioactive materials to persons or organizations outside the University. Shipment of radioactive materials or devices shall be in accordance with U.S. Department of Transportation regulations. Records of these transfers are required and shall be maintained for three years after the transfer. The RSO shall maintain records showing the recipients of radioactive material are appropriately licensed or authorized to receive the materials.
- 10.9 Occupational Dose – GMU shall monitor occupational exposure to radiation from licensed and unlicensed radiation sources under the control of GMU and shall supply and require the use of individual monitoring devices (radiation badges) by the individuals listed in 10.5.1 to 10.5.4. The issuance of monitoring devices is at the discretion of the RSO based on a review of the exposure conditions, radionuclides and quantities to be used, and other factors. Individuals likely to exceed 10% of the annual dose limits specified in 10 CFR 20.1201 from intake of radioactive materials shall be monitored by determining the concentrations of radioactive materials in air in work areas, quantities of radionuclides in the body, quantities of radionuclides excreted from the body, or a combination of these measurements.
- 10.9.1 Adults likely to receive, in 1 year from sources external to the body, a dose in excess of 500 mrem (whole body deep dose), 1.5 rem lens dose, or 5 rem shallow (skin) or extremity dose.

- 10.9.2 Minors likely to receive, in 1 year, from radiation sources external to the body, a deep dose equivalent in excess of 100 mrem (1 mSv), a lens dose equivalent in excess of 0.15 rem (1.5 mSv), or a shallow dose equivalent to the skin or to the extremities in excess of 0.5 rem (5 mSv).
- 10.9.3 Declared pregnant women likely to receive during the entire pregnancy, from radiation sources external to the body, a deep dose equivalent in excess of 100 mrem (1 mSv).
- 10.9.4 Deleted because GMU does not have any areas designated as High or Very High Radiation areas (specific NRC terms)

10.10 Safe Use of Radioactive Materials and Emergency Procedures

- 10.10.1 Appropriate protective clothing will be worn at all times in areas where licensed materials are used and contamination is possible.
- 10.10.2 Appropriate measures will be taken when using unsealed sources to prevent accidental exposure to radiation through breaks in the skin or via the mouth, nose, or eyes.
- 10.10.3 Food and beverages are prohibited in radioactive material usage areas. Eating, drinking and applying cosmetics are prohibited in radioactive material use area.
- 10.10.4 Work with unsealed radioactive sources will be conducted in an area equipped with spill trays or absorbent paper with impermeable backing.
- 10.10.5 Mouth pipetting is prohibited. Pipette filling devices and other mechanical devices will be used whenever their use will assist in reducing radiation exposure.
- 10.10.6 Radioactive solutions will be stored in appropriately labeled containers stating "Caution Radioactive Material", an estimate of the amount of material present, and reference date.
- 10.10.7 Proper shielding will be used when radioactive materials are used and/or stored.

- 10.10.8 All work using volatile or potentially volatile radioactive materials or in which radioactive gases, fumes, or vapors are created must be done in a hood.
- 10.10.9 Non-disposable glassware that becomes contaminated with radioactive material will be washed in designated sinks and allowed to dry in designated areas.
- 10.10.10 Contaminated equipment, such as glassware and pipettes used with radioactive materials will be properly labeled, and shall not be sent from the area to central cleaning facilities, repair shops or to surplus until demonstrated to be free from contamination.
- 10.10.11 Radioactive waste will be disposed only in designated, labeled and properly shielded receptacles.
- 10.10.12 Licensed material must be in locked rooms or locked containers when it is not under the constant surveillance and immediate control of the user(s).
- 10.10.13 Transfer of any radioactive material between buildings or rooms will be done expeditiously. Sources with exposure rates greater than 2 mR/hr at 30 cm should be moved in portable shielded containers. Appropriate measures, such as the use of absorbent material and secondary containers will be taken to prevent breakage or spillage during transport of radioactive material.
- 10.10.14 Radioactive material that is contained in stock vials or other containers, radioactive material in experiments, radioactive material which may be in liquid scintillation vials, radioactive standards used with liquid scintillation vials and radioactive material contained in waste shall be secured to prevent theft or unauthorized removal. These security policies do not apply to low level contaminated items such as pipettes and lab glassware, low level items that are labeled with "radioactive material" tape, radioactive check sources secured to Geiger counters, or radioactive sources which are integral parts of equipment which cannot be easily removed (e.g. internal standardization sources). Users of generally licensed devices are responsible for assuring the devices are properly secured to prevent theft or unauthorized removal.

- 10.10.14.1 Radioactive material in use will be kept under constant surveillance and control.
- 10.10.14.2 Radioactive Material in storage will be secured from unauthorized removal or access. This will be accomplished by locking the door to the room or by locking all radioactive material storage containers in the room.
- 10.10.15 The RSO shall be immediately notified in the event of a major spill of radioactive material, any high or unusual doses from external radiation sources, or fires involving radioactive materials. A major spill involves an affected area that is greater than 2 square meters, an activity that is greater than 100 μCi , or measured radiation levels greater than 2 mrem/hr at 30 cm.
- 10.10.16 The RSO shall be immediately notified of any suspected theft or loss of radioactive material. The Approved User should provide a report to the RSO stating the circumstances of the suspected theft or loss and the type and amount of radioactive material involved.
- 10.10.17 Any after-hour emergencies will be called to University Police. The RSO will be notified and will provide guidance on actions to be taken.
- 10.10.18 In the event a person becomes contaminated, the contaminated area of skin will be washed for 2-3 minutes with lukewarm water and soap, then rinsed thoroughly with water. Washing and rinsing will be repeated until monitoring indicates that contamination has been removed. The skin area should not be scrubbed or otherwise irritated.
- 10.10.19 The Approved User will be informed of the incident regardless of the amount of contamination. The RSO will be notified as soon as practical.
- 10.10.20 If a work or public area becomes contaminated, the area should be controlled to prevent unauthorized access and to prevent the spread of contamination. The individual user should leave the room and lock the door, when there is contamination covering an area greater than 2 square meters. The individual user should contact the RSO immediately and not re-enter the room

until it has been decontaminated by the appropriate individuals and the entry is permitted by the RSO.

- 10.10.21 The RSO and Approved User will be immediately notified if decontamination procedures fail to lower contamination levels to below the action levels specified in section 10.10.

10.11 Surveys

- 10.11.1 Daily surveys of area in which unsealed radioactive materials are used shall be conducted when materials are used. After working with unsealed radioactive materials, the user shall monitor the work area with an appropriate survey meter. If only low-energy beta emitting radionuclides are used (such as ^3H), then wipe test samples shall be collected and analyzed to determine if any contamination exists.
- 10.11.2 Workers shall monitor themselves and their clothing after handling unsealed radioactive materials. The worker will decontaminate himself if any skin contamination is found. Contaminated clothing shall be removed and contained to prevent the spread of radioactive contamination. The RSO will be notified if the worker or his/her clothing is contaminated.
- 10.11.3 Monthly surveys shall be conducted of areas in which unsealed radioactive materials have been used. Monthly surveys need not be conducted in months in which no radioactive materials were used. Monthly surveys will consist of a sufficient number of wipe test samples to adequately assess the existence of contamination in the work area. The surveys will be documented and provided to the Radiation Safety Officer or kept in the area surveyed.
- 10.11.4 For areas in which radioactive material use will cease, a comprehensive survey for radioactive contamination will be conducted. This survey will consist of radiation measurements with portable radiation detectors and wipe samples. If only low-energy beta emitting radionuclides are used (such as ^3H), then only wipe test samples will be collected and analyzed to determine if any contamination exists. If no contamination is found, the RSO may inactivate the area for radioactive material use.

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10.11.5 Action levels - Any radioactive contamination found above 2,200 dpm/100 cm² for beta/gamma emitters will be immediately cleaned. Any radioactive contamination found above 220 dpm/100 cm² for alpha emitters will be immediately cleaned. Action levels for contamination found in public areas are one tenth of the levels stated above.

10.11.6 Bioassay for Iodine

10.11.6.1 In accordance with U.S. Nuclear Regulatory Commission Regulatory Guide 8.20 the criteria for performing thyroid scans will be based upon the quantities of ¹²⁵I that are expected to be handled at any one time or over a 3-month period as summarized in the following chart:

| Thyroid Scans for ¹²⁵ I | | |
|------------------------------------|--------------|------------|
| | Unbound form | Bound form |
| Open Room | ≥ 0.1 mCi | ≥ 1 mCi |
| Fume Hood | ≥ 1 mCi | ≥ 10 mCi |

10.11.6.2 When thyroid scans are used, the following criteria will be followed.

10.11.6.2.1 A baseline thyroid scan will be made before the initial handling of the radioiodine. Alternatively, urine sampling may be performed.

10.11.6.2.2 Additional in-vivo measurements will be taken between 6 and 72 hours after first use (24 hours is optimal). If urine sampling is performed, samples will be collected between 6 and 72 hours after first use.

10.11.6.2.3 Continuing bioassays will continue once every other week for the first 3 months, and quarterly thereafter.

10.11.6.2.4 If a bioassay reveals 0.4 μCi (approximately 10% of the oral ingestion ALI) is reached for ¹²⁵I, additional testing may be required after procedures to determine intakes and assess

actions to be taken to prevent additional intakes.

- 10.11.6.2.5 A NaI detector system or a Ludlum model 3 survey meter fitted with a scintillation probe will be used to perform *in-vivo* thyroid scans. Urine samples will be analyzed in-house or by an appropriately licensed analytical laboratory.
- 10.11.7 Bioassay for other radionuclides – Individuals using greater than 50 mCi of an unsealed, potentially volatile radionuclide at any one time will have a baseline bioassay performed before the experiment and a follow-up bioassay within 72 hours after the experiment. Bioassay measurements will likely consist of urine sampling and analysis.
- 10.11.8 Bioassay following suspected intakes – Any individual suspected of having an intake of any radioactive material, such as after an accident in which a person becomes contaminated, will be bioassayed as soon as practicable after the possible intake. The mode of the bioassay will be based on the radionuclide that was being handled.
- 10.11.9 Leak Tests
 - 10.11.9.1 Each sealed source containing radioactive material, other than ^3H , with a half-life greater than 30 days and in any form other than gas will be tested for leakage and/or contamination at intervals not to exceed 6 months or as specified in the sealed source device registration certificate. In the absence of a certificate from a transferor indicating that a test has been made within 6 months prior to the transfer, the sealed source shall not be put into use until tested. If there is a reason to suspect that a sealed source might have been damaged, or might be leaking, it will be tested for leakage before further use. Leak tests will be provided for by a properly licensed individual or company.
 - 10.11.9.2 Records of leak tests shall be kept in units of microcuries and maintained by the RSO.
 - 10.11.9.3 If the test reveals the presence of 0.005 microcuries or more of removable contamination, the RSO shall

immediately withdraw the sealed source from use and cause it to be decontaminated and repaired or to be disposed of in accordance with disposal requirements.

- 10.11.9.4 Any licensed sealed source is exempt from leak tests when the source contains 100 microcuries or less beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material.

11. WASTE MANAGEMENT

- 11.1 Users of radioactive materials that generate radioactive waste are responsible for placing the waste in appropriately labeled receptacles, securing the waste within laboratories, and notifying the RSO when removal from a laboratory is required. Waste generators are responsible for informing the RSO of the radionuclides and estimated activity contained in each waste item, as well as other hazards posed by the waste, such as the presence of hazardous or infectious wastes.
- 11.2 Records are maintained of radioactive waste generated, stored, and disposed of by decay-in-storage or via the sanitary sewer or through a commercial licensed broker or licensed disposal facility. The activity in liquid waste prior to release to the sanitary sewer will be assessed by the user and compared to release limits established by the RSO. Records of such releases will be made by the user. The RSO will review these records and make calculations of the release concentrations based on average monthly water use and compared to limits specified in 10 CFR 20 Appendix B, Table 3. Only licensed material that is readily soluble (or is readily dispersible biological material) in water shall be discharged to the sewer system.
- 11.3 The activity in the dry/solid and liquid scintillation vials will be estimated by the users prior to transfer to the waste storage area. The waste will be placed in appropriate storage containers for radioactive decay or in 30- or 55-gallon drums for shipment off-site for disposal. The total activity in these containers will be maintained and this information transferred to the shipping papers for off-site transfer of the radioactive materials. Copies of these shipping papers will be held by the RSO or her designee in the shipping/receiving department at GMU in accordance with DOT regulations.
- 11.4 GMU will contract with and appropriately licensed waste broker/processor for off-site transfer of dry/solid radioactive materials, liquid scintillation vials, and other radioactive wastes, as necessary. If practical, GMU may

use an appropriately licensed vendor for decay-in-storage of short-lived radioactive wastes if storage space on-site is not available.

- 11.5 Radioactive Decay-in-Storage – Radioactive wastes containing radioactive material with half lives less than or equal to 120 days may be held for decay-in-storage before disposal without regard to its radioactivity. Prior to disposal, GMU will monitor the waste at the surface before disposal and determine that its radioactivity cannot be distinguished from the background radiation level with an appropriate radiation detection survey meter set on its most sensitive scale and with no interposed shielding. GMU will then remove or obliterate all radiation labels, except for radiation labels on materials that are within containers and that will be managed as biomedical waste after they have been released. GMU shall retain a record of each disposal permitted under this section in accordance with 11.5.1 through 11.5.2.
- 11.5.1 GMU shall maintain records of the disposal of licensed materials via decay-in-storage for 3 years.
- 11.5.2 The record must include the date of the disposal, the survey instrument used, the background radiation level, the radiation level measured at the surface of each waste container, and the name of the individual who performed the survey.
- 11.6 Radioactive wastes are stored in the laboratories in which it is generated until moved to centralized storage locations. Access to the laboratories is limited by locking the rooms or the containers with radioactive waste. Rooms containing radioactive waste are to be locked at nights and on weekends if the waste cannot be secured within the room.
- 11.7 Radioactive waste collected from laboratories will be placed in centralized storage rooms located on each campus. Room 1038 in David King Hall is the storage location for the Fairfax, Virginia campus and Room 119 in Discovery Hall is the location at the Manassas, Virginia campus. Radioactive wastes (decay-in-storage) are placed 5 gallon pails, cardboard boxes, or in 30- or 55-gallon drums. Containers will be regularly inspected to assure there is no degradation of integrity. It is expected that the 30- and 55-gallon drums will be utilized as shipping containers when the waste is collected by a licensed broker/vendor.
- 11.8 HAZMAT Training – Individuals involved in shipping radioactive wastes shall complete required radioactive materials shipping training, as specified in U.S. Department of Transportation regulations found at 49 CFR 172, Subpart H and NRC regulations found at 10 CFR 71.5.

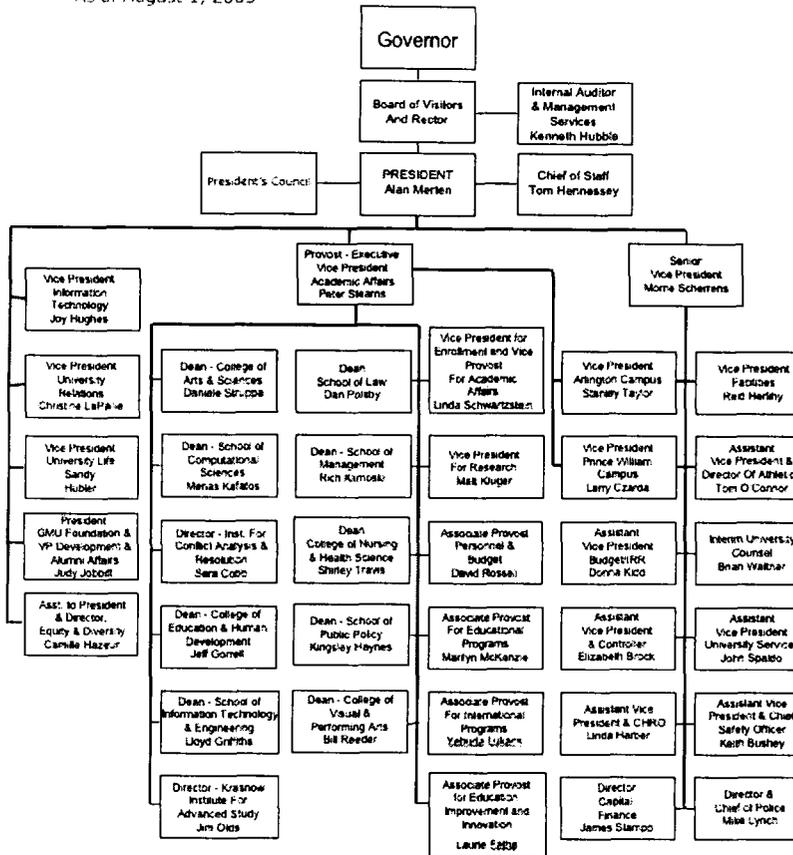
12. FEES

- 12.1 As a not-for-profit State University, George Mason University is not required to pay fees for license renewal.

Attachment 1

George Mason University Organizational Chart

ADMINISTRATION ORGANIZATIONAL CHART
As of August 1, 2005



Attachment 2

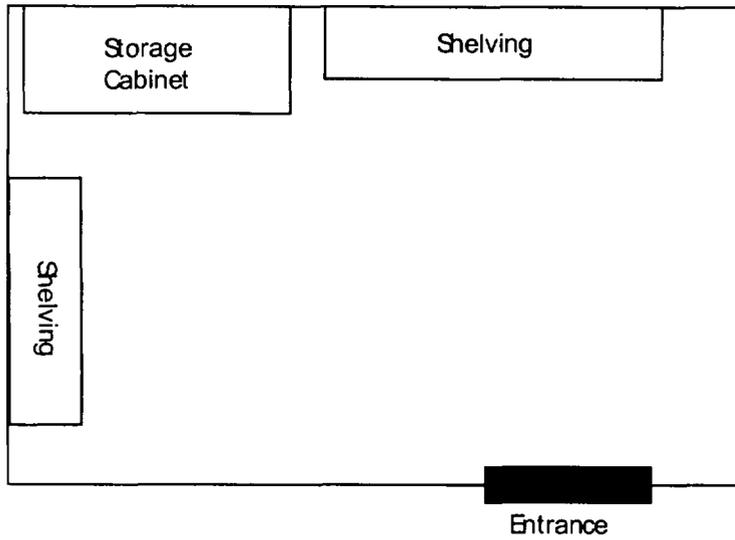
Training and Experience for Radiation Safety Officer

| TRAINING AND EXPERIENCE AUTHORIZED USER OR RADIATION SAFETY OFFICER | | | | |
|---|--|--|--|---|
| 1. Name of Proposed Authorized User or Radiation Safety Officer Diann R. Stedman | | | 2. For Physicians, State or Territory where Licensed N.A. | |
| 3. Certification | | | | |
| Specialty Board A | Category B | Month and Year Certified C | | |
| | | | | |
| 4. Training Received in Basic Radioisotope Handling Techniques | | | | |
| Field of Training A | Location and Date(s) of Training B | Type and Length of Training | | |
| | | Clock Hours in Lecture or Laboratory | Clock Hours of Supervised On-The-Job Experience | |
| a. RADIATION PHYSICS AND INSTRUMENTATION | Radiation Safety Academy, Rockville, MD October 25-29, 2004 | 19.5 hours | 200 hours | |
| b. RADIATION PROTECTION | Radiation Safety Academy, Rockville, MD October 25-29, 2004 | 20.5 hours | 300 hours | |
| c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY | Radiation Safety Academy, Rockville, MD October 25-29, 2004 | 3.5 hours | 75 hours | |
| d. RADIATION BIOLOGY | Radiation Safety Academy, Rockville, MD October 25-29, 2004 | 5.0 hours | - | |
| e. RADIOPHARMACEUTICAL CHEMISTRY | | ----- | - | |
| 5. Experience with Radiation or Radioactive Materials (<i>Actual use of Radioisotopes or Equivalent Experience</i>) | | | | |
| Isotope/Source | Activity Used at one time (mCi / MBq) | Location | Clock Hours | Type of Use |
| P-32, S-35, C-14 | 0.5 mCi | Yale University School of Medicine Virginia Commonwealth University | Over 300 hours between 1994 and 2002 | Molecular Research (kinase assays, Southern and Northern blot analysis, protein expression assays) |

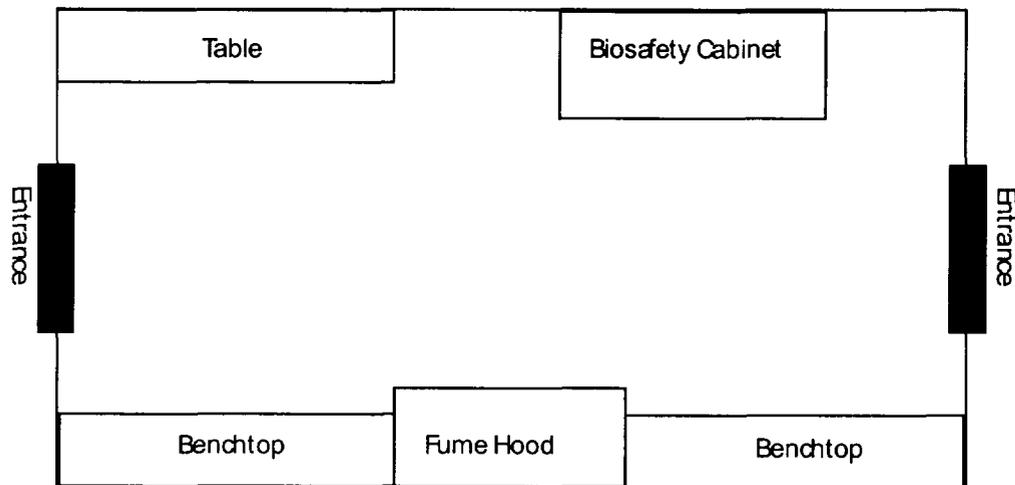
Attachment 3

Samples of radioactive material use and storage areas

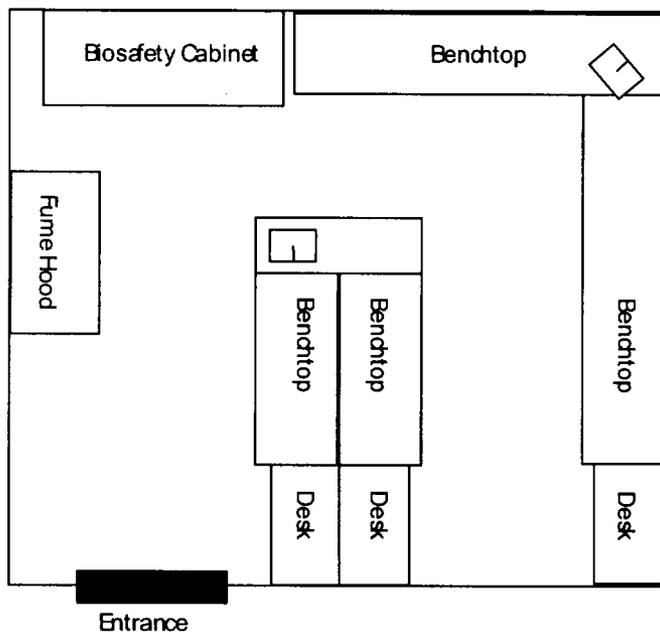
Discovery Hall, room 119



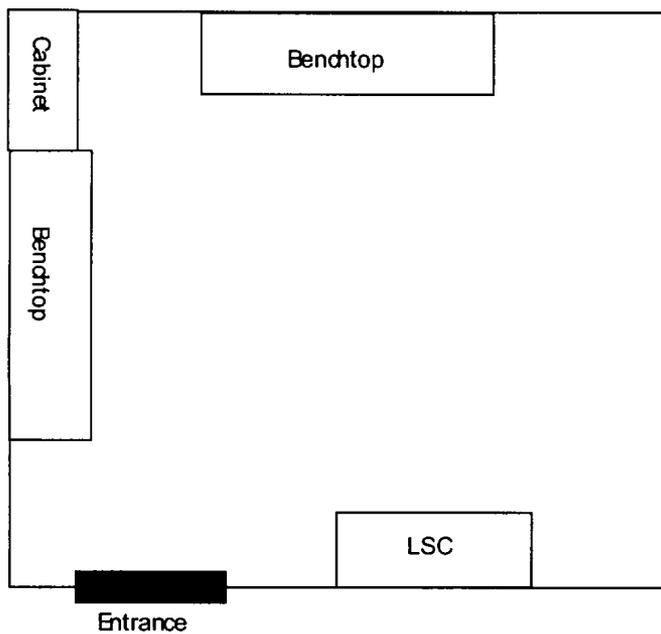
Discovery Hall, room 237



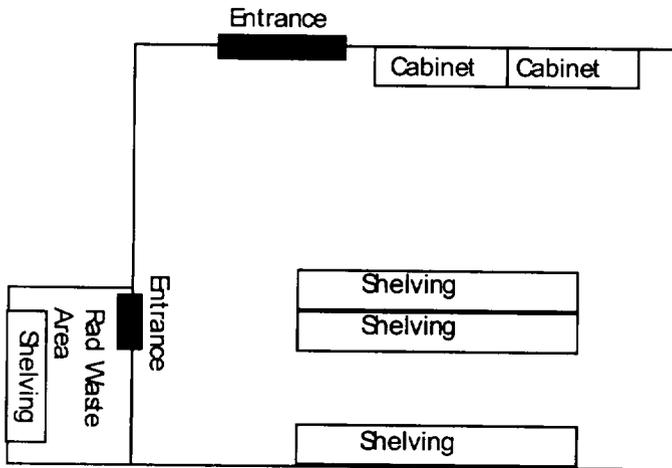
Occoquan Building, room 411



Occoquan Building, room 427



David King Hall, room 1038



David King Hall, room 3053

David King Hall, room 3051

