

03021063

VOID SHEET

TO: License Fee Management Branch

FROM: RI

SUBJECT: VOIDED APPLICATION

Control Number: 122729

Applicant: DEPARTMENT OF THE ARMY

Date Voided: AUGUST 5, 1996

Reason for Void: Licensee agreed to apply for separate  
new license & therefore void this action.  
After review. 28-07946-06

Rebecca J. Brown 8/5/96  
Signature Date

Attachment:  
Official Record Copy of  
Voided Action

FOR LFMB USE ONLY

Final Review of VOID Completed:

Refund Authorized and processed

No Refund Due

Fee Exempt or Fee Not Required

Comments: \_\_\_\_\_

Log completed

Processed by: \_\_\_\_\_

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ORIGINAL SIGNED BY: ML 10

APR 22 1996

License No. 28-07946-06  
Docket No. 030-21063  
Control No. 122729

Bob Stout, CESO-I  
U.S. Army Corps of Engineers  
20 Massachusetts Avenue N.W. Room 4122C  
Washington, D.C. 20314-1000

Dear Mr. Stout:

This is in reference to the letter dated December 21, 1995 from Robert S. Sletten requesting to amend License No. 28-07946-06. In order to continue our review, we need the following additional information:

1. Your application should have been signed by a management representative rather than the Radiation Protection Officer. Please submit a letter signed by a management representative indicating that management has reviewed the application and concurs in the statements and representations contained therein. Note also that a management representative should sign all future correspondence which request change in your license.
2. Beryllium-7 and cobalt-57 are not byproduct material as defined in 10 CFR 30.4 and are not subject to licensing by the NRC. Therefore, you may procure and use them without amendment to your NRC material license. However, you should contact your State regulatory authorities to determine the State licensing or registration requirements for use of these radionuclides.
3. The possession limits for unsealed specifically listed radionuclides requested in your licensing action (on the first page) require that you submit financial assurance in accordance with the requirements of 10 CFR 30.35. Submit the required financial assurance (\$750,000) or modify your licensing request such that financial assurance is not required. You may wish to refer to Regulatory Guide 3.66 (enclosed) for assistance in formulating your response.
4. Pages 2 and 3 of the letter dated December 21, 1995 indicate the potential use of uranium and thorium. Please confirm that you will not possess more than 15 pounds of source material at any one time in accordance with 10 CFR 40.22.

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5. Page 2 of the letter dated December 21, 1995 describes how you wish to handle Category I material as exempt or generally licensed material and transfer the material to non-licensed laboratories. General or exempt material cannot be transferred to non-licensed facilities. With the appropriate instrumentation, you may determine a sample is free of radioactivity. Provide your procedure for determining if a sample is free of radioactivity.
6. Page 3 of the letter dated December 21, 1995 identifies Material Classification Levels. Please explain how this system works and the meaning of the footnote. In addition, please explain if all sample activity conditions have to be met to fit the Category classification.
7. The Radiological Safety Program attached to the letter dated December 21, 1995 mentions a Radiation Safety Committee (RSC). Typically, a RSC is established for a broad scope licensee. The quantities of radioactive material requested do not warrant a broad scope license. Please verify if your intent is to be a broad scope licensee. Regulatory Guide 10.5 is enclosed.
8. Page 2 of the Radiological Safety Program indicates that the RSC will approve users and the Radiation Protection Officer (RPO) will approve of rooms where radioactive materials may be used or stored. This is an acceptable practice for a broad-scope licensee. For other licensees, the NRC typically approves users and rooms.
9. Please submit investigational levels for dose to the whole body, dose to the extremities (hands, feet, etc.) and for dose to the skin.
10. Please submit the NVLAP accredited dosimetry processor you will use.
11. In your application, you stated that dosimetry devices will be assigned if it is determined that workers are likely to receive in excess of 10% of the maximum whole body or extremity exposures. Please submit your criteria for determining which individuals are likely to exceed 10% of the regulatory limits. These criteria should consider both routine handling and accidents which are likely to occur, such as spills. If you wish, you may determine the need for dosimetry based on the radionuclides and quantities handled by the individual.
12. Pages 6 and 7 of the Radiological Safety Program addresses receipt of radioactive material. However, the procedures described are not consistent with 10 CFR 20.1906. Provide procedures for examining incoming packages for leakage, contamination, or damage and for safely opening packages in accordance with 10 CFR 20.1906. 10 CFR 20.1906(a)(b) and (c) address package receipt requirements and state, in part, that each licensee shall monitor the surfaces of a labeled package for radioactive contamination within 3 hours of receipt if it is received during normal working hours or not later than 3 hours from the beginning of the next working day if it is received after normal working hours.

10 CFR 20.1906(e) addresses package opening requirements and states, in part, that each licensee shall establish and maintain written procedures for safely opening packages in which licensed material is received. The procedures may vary depending upon the quantity of licensed material received, but should, at a minimum, include instructions for surveying packages, wearing gloves while opening packages, and checking packing material for contamination. Even though the regulation exempts certain packages from immediate monitoring, all licensees must have safe opening procedures for all packages containing licensed material in accordance with 10 CFR 20.1906(e).

13. On pages 6, 7, and 8 of your procedures for the handling of incoming radionuclide shipments, the trigger level is set at 200 mR/hr at the surface of the package. This trigger level may be too high and should depend on the package labels, e.g., the dose rate from packages with "White I" labels should be less than 0.5 millirem per hour at the package surface. Your procedures should also include a wipe test of the final source container if there is any reason to suspect contamination. Please submit a copy of your revised procedures.
14. Page 4 of the Radiological Safety Program indicates that bioassays are required when handling twice the ALI. If a person were to ingest or inhale an ALI amount of radioactivity, this would equate to a dose of 5 rems, the annual occupational exposure limit. If a person were to ingest or inhale two ALIs of radioactivity, this would equate to an overexposure. Bioassays are performed to verify that occupational dose limits are not exceeded. Therefore your criteria for bioassay seems flawed. Submit your revised bioassay program, including the type of bioassay (thyroid counts, urine counts, whole body counts, etc), the criteria and the frequency for performing bioassays, and the type of action taken when positive results are obtained. It is recommended that bioassay procedures be considered for personnel using millicurie quantities of tritiated organic compounds, iodine-131, and iodine-125 in noncontained forms.
15. In your application, you didn't describe a training program for ancillary personnel (maintenance, security, etc.) and personnel involved in radionuclide work. Please describe a program that will:
  - a. be of sufficient scope to ensure that all personnel using licensed materials, or frequenting areas where licensed materials are used, receive proper instruction in accordance with 10 CFR 19.12 (enclosed);
  - b. assure that personnel are instructed before assuming duties with, or in the vicinity of, licensed materials with retraining as necessary;
  - c. specify a frequency for retraining (annually is acceptable).

The training given to each group should be commensurate with the duties and responsibilities of the group and need not be the same for each group.



16. Page 3 of the letter dated December 21, 1995 indicates that Robert S. Sletten will supervise the use of the material listed in this amendment request. However, Mr. Sletten's prior experience does not address handling unsealed radioactive material as requested in this amendment. The supervisor should have training and experience commensurate with the requested radioactive materials. Provide a brief resume of the training and experience of each person who will directly supervise the use of material, who will use material without supervision, or who will have responsibility for radiological safety. The resume should include the type (on-the-job or formal course work), location, and duration of the training. Training should cover (a) principles and practices of radiation protection, (b) radioactivity measurements, standardization, and monitoring techniques and instruments, (c) mathematics and calculations basic to the use and measurement of radioactivity, and (d) biological effects of radiation. The description of the use of licensed materials should include the specific isotopes handled, the maximum quantities of materials handled, where the experience was gained, the duration of experience, and the type of use.
17. Pages 2 and 3 of the Radiological Safety Program identifies loose contamination levels (2,200 dpm/100 cm<sup>2</sup> for I-125 and 220 dpm/100 cm<sup>2</sup> for I-131). Please note that the acceptable removable surface contamination level for I-125 and I-131 is 20 dpm/100 cm<sup>2</sup> and 200 dpm/100 cm<sup>2</sup> respectfully. The acceptable removable surface contamination level for beta-gamma emitters is 1,000 dpm/100 cm<sup>2</sup>. Please confirm that you will adhere to the levels documented in NRC's "Guidance for Decontamination of Facilities and Equipment Prior to Release For Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material" (enclosed). In addition, verify the skin contamination limits specified on page 3 of the Radiological Safety Program. Further, please verify the levels addressed on pages 11 and 13 of the Radiological Safety Program.
18. Page 3 of the Radiological Safety Program states, in part, that if residual contamination exceeds these limits and repeated decontamination attempts fail, the individual may be released since his contamination is now relatively fixed and not likely to enter the body. This statement is false and should be deleted. Radioactive material may enter through the skin and be absorbed into the bloodstream. It is very dependent upon the chemical form of the nuclide in question.
19. Personnel contamination that is the result of a deliberate action shall be reported to the NRC (see enclosed Information Notice 95-51). Please revise your Radiological Safety Program to include this new reporting item.

20. Page 8 of the Radiological Safety Program indicates that radioactive material must be stored with sufficient shielding so that the radiation level at one meter does not exceed 2.5 mR/hr. Page 11 of the Radiological Safety Program indicates levels of fixed contamination will be maintained at 2 mrem/hr. Please note that 10 CFR 20.1301 requires doses in unrestricted areas to not exceed 2.0 mrem in any hour and 100 mrem/yr. Please confirm that radiation levels in unrestricted areas will not exceed 2 mrem in any hour and 100 mrem/yr.
21. Page 3 of the Radiological Safety Program indicates that radiation surveys will be conducted if there is a potential for 10% of the dose limits. The 10% limit was designed for the determination of personnel dosimetry, not for radiation surveys. Radiation surveys should be conducted at the same frequency as the surveys for loose radioactive contamination. Please confirm the frequency for radiation surveys (i.e., after each use, monthly, or quarterly).
22. Specify the radiation detection instruments that you have available. Include the manufacturer and model number, the number of instruments available, the types of radiation detected, the range (milliroentgens per hour or counts per minute), and the intended use (monitoring, surveying, assaying or measuring).
23. Your equipment should include a survey instrument with a thin sodium iodide crystal detector probe to detect iodine-125 contamination. Please specify the instrument that will be used for this purpose.
24. Please describe your instrument calibration procedure and state the frequency. If you intend to contract out the calibration of your instruments, you only need to specify the name of the firm and the license number that authorizes the firm to perform calibration services.
25. Describe your procedures for complying with Sections 20.1203, 20.1204, and 20.1302 of 10 CFR Part 20, for procedures such as protein iodinations and tritium labeling experiments that may release volatile or gaseous radioactive materials to restricted and unrestricted areas. You should include a description of the type of surveys (e.g., environmental or breathing zone), frequency of surveys, and the individuals who will perform the surveys (e.g., radiation safety officer or investigator), equipment to be used, and the procedures for evaluating the results.
26. Your application did not specify the instrument used in your bioassay program for determining activity in the thyroid. Please specify your instrumentation and calibration procedures, including the type of phantom you will use.

27. Specify the criteria used to set the type and frequency at which routine surveys for airborne licensed materials are performed (e.g., breathing zone and general work area air sampling, hood and room ventilation air flow rate measurement, and stack effluent sampling). Describe the instrumentation that will be used for sample collection and analysis, the calibration method and frequency for each, and specify the lower limit of detection and action levels for each.
28. In support of your request for more than one millicurie of phosphorus-32, submit special safety instructions to be provided to individuals. Your procedures should include:
  - a. the use of low density shielding (e.g., plexiglass) in order to keep Bremsstrahlung radiation at a minimum,
  - b. a mandatory radiation survey and wipe test for radioactive contamination after each use,
  - c. the use of finger extremity monitors for procedures that involve one millicurie or more,
  - d. a dry run prior to the performance of unfamiliar procedures in order to preclude unexpected complications. In addition, it is recommended that the radiation protection officer be present during new procedures, and
  - e. the use of eye protection for procedures that involve 10 millicuries or more.
29. In support of your request for more than one millicurie of radioiodine, submit special safety instructions to be provided to individuals. Your procedures should include:
  - a. A mandatory radiation survey and wipe test for radioactive contamination after each use.
  - b. Bioassay procedures for individuals working with millicurie quantities of radioiodine.
  - c. The use of vented hoods for iodination and for the storage of millicurie quantities of radioiodine.
  - d. A dry run prior to the performance of unfamiliar procedures in order to preclude unexpected complications. In addition, it is recommended that the radiation protection officer be present during new procedures.
  - e. Procedures for measuring the concentration of radioiodine from the hoods where material is stored and where iodinations are performed.

30. 10 CFR 20.1801 requires that licensed material be secured against unauthorized removal from the place of storage. 10 CFR 20.1802 requires that the licensee control and maintain constant surveillance over materials in unrestricted areas that are not in storage. In your application, you did not indicate how you will secure licensed material. Describe how you will preclude the unauthorized removal of licensed material from the place of storage and in unrestricted areas.
31. Pages 17 and 18 of the Radiological Safety Program provide brief descriptions of the rooms where radioactive material will be used. Please describe the facilities and equipment (e.g., remote handling equipment, storage containers, shielding, fume hoods) to be made available at each location where licensed material will be used. Submit a description of the areas assigned for the receipt, storage, preparation, and measurement of licensed materials. Submit a diagram showing the locations of shielding, the proximity of radiation sources to unrestricted areas, and other items related to radiation safety. For facilities where licensed materials may become airborne, include schematic descriptions of the ventilation system, with pertinent airflow rates, pressures, filtration equipment, and monitoring instruments. Diagrams should be drawn to a specified scale, or dimensions should be indicated.
32. On page 17, you make reference to 10 CFR 20.303. Effective January 1, 1994, the regulations of 10 CFR 20.1001 through 20.2402 superseded the regulations of 10 CFR 20.1 through 20.602. Please evaluate all references to 10 CFR 20.1 through 10 CFR 20.602 in your application for compatibility with the corresponding sections of 10 CFR 20.1001 through 10 CFR 20.2402. Confirm that you will revise your application to change all references to 10 CFR 20.1 through 10 CFR 20.602 to the corresponding sections of 10 CFR 20.1001 through 10 CFR 20.2402.
33. The last sentence in the second to last paragraph on page 8 of the Radiological Safety Program states "All radioactive waste materials must be transferred to a licensed disposal site, held for decay in storage, or transferred to an approved disposal site for non-radioactive waste." The latter statement that radwaste may be transferred to a non-radwaste disposal site is not an acceptable practice. Please revise this statement.
34. Page 9 of the Radiological Safety Program states, in part, that the RPO will provide rules for the disposition of organic bulk liquids. Please provide these rules.
35. 10 CFR 20.2003(a)(1) requires that a licensee may discharge licensed material into sanitary sewerage if the material is readily soluble (or is readily dispersible biological material). Information Notice 94-07 (enclosed) provides methods for determining compliance with this requirement which are acceptable to the NRC.



Please review this Information Notice and provide specific information as to how you will assure that your releases to the sanitary sewerage system will meet the solubility criteria in 10 CFR 20.2003(a)(1). If you wish, you may indicate that you will use one of the methods described in Information Notice 94-07. Otherwise, describe your alternative methodology including the models, calculations, analytical techniques, and quality control measurements as well as the records that will be maintained.

In addition, provide calculations to show compliance with 10 CFR 20.2003(a)(2)(3)(4) and confirm that records will be maintained of all disposals made into the sanitary sewerage system.

36. Your statements throughout page 9 and the top of page 11 of the Radiological Safety Program concerning holding radioactive waste for decay and disposing of this material as non-radioactive, do not address surveying of the waste material prior to disposition. Provide your procedures for disposal of licensed radioactive waste by decay-in-storage. Your procedures must provide assurance that you will:
  - a. hold the radioactive waste in storage for at least 10 half-lives,
  - b. survey the waste in a low background area with a low-level survey meter with all the shielding removed,
  - c. not dispose of the waste as normal trash unless the radiation level is at background,
  - d. remove or deface the radioactive material labels or otherwise indicate that containers no longer hold radioactive materials, and
  - e. you will maintain records of these waste disposal surveys.

"Guidance to Licensees Regarding Requests to Dispose of Radioactive Waste by Decay-In-Storage" (enclosed) may be helpful in preparing your response.
37. The second to last paragraph on page 11 of the Radiological Safety Program states, in part, that the surface of the solid waste will be surveyed. Please indicate how you will ensure that you will not dispose of radioactive material as non-radioactive material if you are only surveying the surface.
38. The third paragraph on pages 13 and 14 of the Radiological Safety Program address a limit of twice background for decay-in-storage waste. Please confirm that waste will not be disposed as normal trash unless the radiation level is at background.
39. The fourth paragraph on page 14 of the Radiological Safety Program incorrectly defines a radiation Area. Please refer to the definition in 10 CFR 20.1003.

40. Pages 9 and 13 of the Radiological Safety Program address incineration of waste containing H-3 and C-14. In order for the NRC to authorize you to dispose of licensed materials by incineration, you must submit evidence that all state and local regulations concerning incineration of radioactive material have been met by your institution.
41. If you propose to treat or dispose of licensed material by incineration, you must address the items listed in Regulatory Guide 10.5, Second Proposed Revision 2 (DG-0005), Appendix L and receive specific approval from the NRC. Specific NRC approval is required if you wish to dispose of ash as ordinary waste. However, approval to dispose of ash as radioactive waste is not required.
42. The second to last paragraph on page 9 and the first paragraph on page 13 of the Radiological Safety Program states that LSV containing 0.05 microcuries per gram of H-3 and C-14 may currently be shipped offsite for disposal as non-radioactive waste in accordance with Section 20.2005(a)(2). 10 CFR 20.2005(a)(2) refers to animal tissue. 10 CFR 20.2005(a)(1) refers to 0.05 microcurie, or less, of hydrogen-3 or carbon-14 per gram of medium used for scintillation counting. Please correct your statement to identify "per gram of scintillation medium".
43. In three instances, on pages 10 and 11 of the Radiological Safety Program, there is a statement that reads: "It is not practicable to quantify exactly the quantity of radioactive material being added each time, and this approach has been approved by the NRC." This statement should be deleted. It is the responsibility of the licensee to maintain accurate and complete records in accordance with 10 CFR 30.9. Please revise your procedures for disposal of radioactive material to ensure complete and accurate information.
44. On page 9 of the Radiological Safety Program, you discuss disposal of contaminated clothing. Please revise these procedures to ensure that the remainder of the garment is surveyed prior to disposal as non-radioactive waste.
45. On page 11 of the Radiological Safety Program, you discuss surveying of the WHF with a G.M. probe and wipes. Since your use may include iodine-125 and iodine-131, please indicate the survey instrumentations you will use to identify these types of contaminants.
46. The last sentence on page 13 of the Radiological Safety Program implies that if measured activity is less than or equal to an exempt concentration, packages will shipped as non-radioactive. General or exempt material cannot be transferred to non-licensed facilities and specifically licensed material cannot be converted to general or exempt material. Please revise your procedures to ensure that radioactive material which is acquired through your specific license will be disposed of in accordance with regulations addressed in 10 CFR Part 20.

47. On page 14 of the Radiological Safety Program, you discuss ashing onsite by plasma reduction and compaction. Please provide your safety procedures for these types of volume reduction techniques.
48. 10 CFR 20.1101(c) requires that the licensee review the radiation protection program content and implementation at least annually. Submit a description of your program for performing the required annual review. It should include the following criteria:
  - a. Senior management oversight of the radiation protection program. Specify the mechanisms that will be used by senior management to ensure that they are aware of NRC regulations, the provisions of the license, and the compliance status of the institution's licensed program.
  - b. Review of the Radiation Safety Officer and staff performance. Specify the minimum qualifications for an individual who will perform this review, and confirm that the results will be reported to senior management.
  - c. Audits by the Radiation Safety Officer and staff to determine user compliance with the requirements of the NRC license and your radiation protection program. Audits should include such topics as: reviews of users' inventory and survey records, evaluation of users' radiation safety procedures through observation and discussion, and performance of independent work area surveys.
49. Describe your licensed material inventory, control and accountability program. Your inventory and control system should have the capability to assure that licensed material possession limits are not exceeded and that material is accountable throughout the institution at any given time.
50. Confirm that you will follow DOT regulations during transportation of radioactive material packages.
51. Confirm that you will maintain records of the following activities:
  - a. radiation safety training, including initial and retraining, list of topics covered, the amount of time spent, the date(s), and the instructor(s) and student(s) names.
  - b. results of audits and surveys performed by the Radiation Safety Officer and staff
  - c. decay-in-storage waste records, including the date licensed material is placed into storage, and the date and results of surveys performed when disposed
  - d. receipt and transfer of licensed material
  - e. licensed material inventory
  - f. calibration of radiation monitoring instruments and equipment

B. Stoudt  
U.S. Army Corps of Engineers

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We will continue our review upon receipt of this information. Please reply in duplicate to my attention at the Region I office and refer to Mail Control No. 122729. If you have any technical questions regarding this deficiency letter, please call me at (610) 337-5251.

If we do not receive a reply from you within 30 calendar days from the date of this letter, we shall assume that you do not wish to pursue your application.

Sincerely,  
Original Signed By:  
Kathleen Dolce

Kathleen Dolce  
Division of Nuclear Materials Safety

License No. 28-07946-06  
Docket No. 030-21063  
Control No. 122729

Enclosures:

1. 10 CFR Parts 2, 19, 20, 30, 33, 40, 71, and 171
2. Regulatory Guide 8.20 Applications for Bioassay for I-125 and I-131
3. Regulatory Guide 8.25 Air Sampling in the Workplace
4. Regulatory Guide 10.5 Applications for Type A Licenses of Broad Scope
5. Regulatory Guide 3.66 Standard Format and Content of Financial Assurance Mechanisms required for Decommissioning under 10 CFR Parts 30, 40, and 70
6. Regulatory Guide 10.7 Guide for the Preparation of Applications for Laboratory and Industrial Use of Small Quantities of Byproduct Material
7. Information Notice 94-07
8. Information Notice 95-51 Recent incidents Involving Potential Loss of Control of Licensed Material
8. Guidance to Licensees Regarding Requests to Dispose of Radioactive Waste by Decay-in-Storage (Non-Medical Waste)
9. Information Required for Commission Approval of Treatment or Disposal by Incineration
10. Policy and Guidance FC 84-21 Incineration by Materials Licensees/Incineration Guidelines for Material Licensees
11. Guidance for Decontamination of Facilities and Equipment prior to Release For Unrestricted use or termination of Licenses for Byproduct, Source or Special Nuclear Material
12. NRC Forms 3 and 313

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B. Stoudt  
U.S. Army Corps of Engineers

-12-

cc w/enclosures:  
Robert S. Sletten, Radiation Protection Officer  
Department of the Army  
Cold Regions Research and Engineering Laboratory  
72 Lyme Road  
Hanover, New Hampshire 03755-1290

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OFFICE	DNMS/RI	N	DNMS/RI				
NAME	Dolce\kadl		Costello				
DATE	04/16/96		04/ /96	04/ /96		04/ /96	

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DEPARTMENT OF THE ARMY  
COLD REGIONS RESEARCH AND ENGINEERING LABORATORY, CORPS OF ENGINEERS  
HANOVER, NEW HAMPSHIRE 03755-1290

December 21, 1995

Environment, Safety, and Security Office

U.S. Nuclear Regulatory Commission  
Region I  
ATTN: Chief, Nuclear Materials Safety Branch  
475 Allendale Road  
King of Prussia, PA 19406

030-21063  
28-07946-06

Dear Sir or Madam:

The US Army Cold Regions Research and Engineering Laboratory (CRREL) currently holds a license from the Nuclear Regulatory Commission (NRC) Number 030-21063 for sealed sources. We are requesting issuance of an amendment to this license to add the use and possession of byproduct material in other than sealed form as defined in 10 CFR part 30. We request possession and use of the following isotopes for laboratory research at the CRREL facility:

<u>ISOTOPE</u>	<u>POSSESSION</u>
Hydrogen-3	500 mCi
Beryllium-7	100 $\mu$ Ci
Carbon-14	500 mCi
Phosphorus-32	10 mCi
Sulfur-35	100 mCi
Cobalt-57	100 $\mu$ Ci
Zinc-65	100 $\mu$ Ci
Strontium-85	100 $\mu$ Ci
Iodine-125	10 mCi
Iodine-131	100 $\mu$ Ci
Cesium-134	50 $\mu$ Ci
Cesium-137	50 $\mu$ Ci
Mercury-203	100 $\mu$ Ci
Lead-210	100 $\mu$ Ci

We are further requesting possession of any byproduct material in the form of environmental samples only in the following concentrations:

1. For byproduct material with Atomic Nos. between 1-95; inclusive, with half-lives less than or equal to 120 days we wish a possession of 10 milliCuries per radionuclide with a total possession not to exceed 50 milliCuries.

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2. For byproduct material with Atomic Nos. between 1-95; inclusive, with half-lives greater than 120 days we wish a possession not to exceed  $10^3 \times 10$  CFR Part 30 Appendix B limits for each radionuclide. Total possession not to exceed  $R/10^3$  is less than or equal to 1; R is the sum of the ratios of the quantity of each radionuclide to the applicable value in 10 CFR Part 30 Appendix B.

We wish to possess the above material and concentrations for the purpose of screening and analyzing unknown, potentially radioactive samples. The screening process will determine what handling restrictions will apply to the material. Listed below are the requirements that will be used in determining radiological status of samples.

Our objective is to define a level by which material can be classified and handled without imposing unnecessary and overly restrictive controls when the levels are at or below most exempt and generally licensed material levels. We understand that environmental samples sent to us as material licensed by the NRC or an Agreement State must remain "licensed material" regardless of the actual concentrations of radionuclides. But we would like to further classify environmental samples with unknown quantities of radioactive material or with "not licensed material."

We have developed a radioactive material handling identification system based on gross alpha, beta, and gamma levels in the table below to identify material handling requirements. We wish to handle Category I material as exempt or generally licensed material and transfer the material to non-licensed laboratories. We base the levels for Category I material on the quantities of generally licensed material and exempt quantities and concentrations listed in 10 CFR 30 and 40. We assume all beta emitting radionuclides to be the most restrictive isotope of Sr-90 and for alpha emitting materials we assume a factor of ten greater protection based on the maximum difference in control factors listed in 10 CFR part 20. We have also allowed for a factor of ten increase in activity concentrations for U-natural, U-238, Th-natural, Th-232, (or their daughters) and H-3. These concentrations are far below the levels that could be received under general license conditions of 10 CFR Parts 30 and 40.

Materials in Category II shall be handled as radioactive material under normal license conditions or sent to other licensees as radioactive material.

This approach was previously approved for PACE, Inc. of Warrendale, PA under NRC License Number 37-30036-01, Reference Number 030-33148. When data are available on specific radionuclides, this information will be used *in lieu* of gross alpha, beta and gamma levels. Check sources and other exempt or generally licensed items (e.g., electron capture detectors) will maintain their exempt or generally licensed status. We shall restrict our possession of licensed material to quantities below the limit specified in 10 CFR 30.35(d), 40.36(b), and 70.25(d) for establishing financial assurance for decommissioning.

# MATERIAL CLASSIFICATION LEVELS

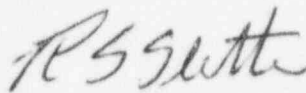
SAMPLE CATEGORY	QUALITATIVE DESCRIPTION	SAMPLE ACTIVITY
Category II	Licensed Material	1) 0.1 mR/hr Contact 2) 0.002 $\mu$ Ci/g Total Activity 3) 0.01 $\mu$ Ci/sample Gross Alpha * 4) 0.1 $\mu$ Ci/sample Gross Beta *
Category I	Unlicensed Material	1) < 0.1 mR/hr Contact 2) < 0.002 $\mu$ Ci/g Total Activity 3) < 0.01 $\mu$ Ci/sample Gross Alpha 4) < 0.1 $\mu$ Ci/sample Gross Beta 5) No Licensed Material

\* If the radiological contaminants in the sample are known to be only U-natural, U-238, Th-natural, Th-232, (or their daughters) or H-3, the classification should be based on ten (10) times the limits given above.

"Total Activity" includes alpha + beta + gamma  $\mu$ Ci/g.

The Radiation Protection Officer (RPO) for this license is Robert S. Sletten, and persons using materials requested in this amendment will be under his supervision. Any questions regarding this request may be directed to the undersigned.

Sincerely,



Robert S. Sletten  
Radiation Protection Officer

Enclosure:  
Radiation Safety Program Supplement



U. S. ARMY COLD REGIONS RESEARCH AND ENGINEERING LABORATORY  
HANOVER, NEW HAMPSHIRE 03755-1290

CRREL REGULATION  
NUMBER 385-1-2 SUPPLEMENT\*

December 21, 1995

Safety  
RADIOLOGICAL SAFETY PROGRAM

1. Purpose. To provide supplemental information for the protection of the employees and visitors of the U. S. Army Cold Regions Research and Engineering Laboratory (USACRREL) and of the general public against potential hazards associated with sources of ionizing radiation from byproduct material in other than sealed form that may be used by laboratory personnel.
2. Applicability. This regulation applies to all personnel engaged in the normal activities of this laboratory who initiate acquisition of, receive, possess, use, transport, or dispose of radioactive material.
3. Policy. It is the policy of this laboratory that an effective Radiation Protection Program will be maintained through the issuance of and adherence to required regulations.
4. Registration and Authorization.
  - a. Radioactive material other than sealed sources may be used only by licensed individuals or under their supervision. All personnel applying for use or procurement of radioactive material are required to:
    - 1) Request and obtain approval in writing for experimental protocol from the Radioisotope Safety Committee through their division chief and the RPO prior to ordering isotopes.
    - 2) Submit copy of the requisition and receipt documents for isotopes to RPO.
    - 3) Conduct periodic wipe tests of experimental areas and submit results to RPO.
    - 4) Determine the need for any required radioactivity counting equipment and procure it, if necessary.
    - 5) Budget for cost of procurement and disposal of isotopes.
    - 6) Satisfactorily complete training as specified by the Radioisotope Safety Committee.

b. The Radioisotope Safety Committee will review these procedures and determine, on the basis of experience and training with radioactive material, if the worker will be allowed to use the radioactive material. In the review, the Radioisotope Safety Committee will consider at least the following:

- 1) Prior experience with radioactivity.
- 2) Prior experience with the particular radionuclides requested.
- 3) Prior experience with general procedures outlined.
- 4) Training in radiation safety.
- 5) Quantity and toxicity of the requested radionuclides.

c. Each room or laboratory in which radioactive material is to be used, handled or stored must be registered with and approved for use by the RPO. Additionally, an area radiation survey must be conducted for each approved room or laboratory prior to any radioactive material being brought into the room. This preoperational survey will be used to establish a reference background level prior to introduction of radioactive materials. Specific laboratories and storage areas have been approved by the NRC for use of unsealed radioactive sources.

##### 5. Radiation Surveys and Monitoring.

a. Wipe Tests: Loose contamination level surveys are to be performed in all areas in which radioactive materials of a dispersible form are used or stored. These surveys are to be performed on a monthly basis. The results of the loose contamination surveys will be recorded in an acceptable format and maintained as a laboratory record by the RPO.

The loose contamination level within a given area is to be determined by analyzing the amount of radioactive contamination collected on an appropriate filter collection media (e.g., a 4.25 centimeter Whatman #1 filter paper or Acme Distributors pre-numbered smear pads). The radioactive contamination is collected by wiping an area of at least 100 cm<sup>2</sup> with the filter paper, applying moderate pressure to the filter paper with the fingertips.

Laboratory areas shall be surveyed on a monthly basis, and several ancillary areas where radioactive materials are not used will be surveyed on a quarterly basis. Loose contamination levels shall be maintained below 22 dpm/100 cm<sup>2</sup> for alpha emitters, 220 dpm/100 cm<sup>2</sup> for beta and x-ray emitters, and 2,200 dpm/100 cm<sup>2</sup> for low-risk beta or x-ray emitters. Low-risk nuclides include C-14, H-3, S-35, Tc-99m, and others whose beta energies are less than 0.2 MeV maximum, whose gamma or x-ray emission is less than

0.1 R/h at 1 meter per Curie, and whose permissible concentration in air (see 10 CFR Part 20, Appendix B, Table I) is greater than 10 microCuries per milliliter.

Surveys of protective garments and linens shall be performed prior to release to a conventional laundry. Garments and linens shall be released to such a laundry only if contamination levels do not exceed 22 dpm/100 cm<sup>2</sup> for alpha emitters, 220 dpm/100 cm<sup>2</sup> for beta or x-ray emitters, and 2,200 dpm/100 cm<sup>2</sup> for low-risk beta or x-ray emitters.

Fixed contamination surveys shall be performed on a monthly basis in areas where radioactive materials are handled. Levels of fixed contamination shall be maintained below 2.0 mR/hr.

- b. Radiation Surveys: Radiation surveys of the laboratory, radioactive material storage areas and surrounding areas shall be performed on a monthly basis. These areas shall include any location where individuals may be exposed to radiation intensities that may cause the occupational radiation dose to exceed 10 percent of the limits of paragraph 20.1201(a) or where an individual is working with any radiation source that could produce radiation levels greater than 1.0 mR/h at 1 meter.
- c. Personnel Contamination and Decontamination: Personnel contamination surveys shall be performed prior to personnel exiting from the restricted areas or when personnel contamination is suspected or likely. Particular attention shall be paid to the body, hair, bottoms of the feet or shoes, and the hands. Workers shall be instructed to report the detection of contamination on the body to the RPO.

Decontamination attempts under the direction of Radiation Protection Officer or a medical consultant should be repeated until (a) such attempts cease to effect significant reductions or (b) such attempts threaten to irritate or harm the skin. Decontamination attempts without supervision of a medical consultant shall be restricted to washing with mild soap and water. If such attempts do not reduce the contamination to acceptable levels, the aid of a medical consultant shall be obtained. Skin contamination levels shall be maintained below 220 dpm/100 cm<sup>2</sup> for alpha emitters, 220 dpm/100 cm<sup>2</sup> for beta or x-ray emitters, and 2,200 dpm/100 cm<sup>2</sup> for low risk beta and x-ray emitters. Although these limits are considered to be safe and acceptable by the Nuclear Regulatory Commission, every reasonable attempt shall be made to prevent any contamination of the skin to meet good ALARA standards. If residual contamination exceeds these limits and repeated decontamination attempts fail to lower levels, the affected individual may be released (since his contamination is now relatively fixed and not likely to enter the body), but periodic surveys shall be made until the limits are no longer exceeded. The resulting dose shall be determined and entered in the individual's personnel dosimetry record. Complete records shall be maintained for each incident of this nature.

Records of all surveys performed shall be maintained in an orderly fashion in a central location by the RPO for personnel review or Nuclear Regulatory Commission inspection.

- d. Personnel Monitoring: All personnel who work with radiation-producing equipment or radioactive material other than tritium and who could receive 10% of occupational radiation dose limits will wear film badge/TLD dosimeters provided by the RPO. Bioassays will be required for personnel who work with volatile radionuclides, unsealed sources containing  $^{90}\text{Sr}/^{90}\text{Y}$ , or radionuclides emitting alpha particles.
- 1) Dosimetry Requirements: All personnel shall be monitored in accordance with 10 CFR 20. In addition, all personnel working in or frequenting the restricted areas shall be assigned whole body TLD monitors or film badges if occupational radiation exposures could meet or exceed 10% of occupational limits. Film/TLD badges shall be worn on the portion of the whole body most likely to receive the maximum radiation. Film/TLD badges shall be assigned by serial number. Film badges will be processed and replaced on a monthly basis; TLD monitors, quarterly. This service shall be performed by a NVLAP accredited activity. Prior to receiving an occupational exposure, all individuals shall be required to complete NRC Form 4 to determine previously accumulated dose. Records of personnel exposure shall be maintained by the Radiation Protection Officer in a central location for personnel or Nuclear Regulatory Commission review. Upon termination of employment, the employer shall report to the employee a complete history of exposure on NRC Form 5.
  - 2) Bioassay Requirements: Individuals handling unsealed radionuclides in relatively large quantities have the risk of incurring significant internal radioactive contamination. The following information is provided to establish the criteria for requiring bioassays.

The occupational intake of radionuclides shall be monitored and the Committed Effective Dose Equivalent (CEDE) calculated whenever adult workers are likely to receive in one year an intake in excess of 10 percent of the applicable Annual Limit on Intake (ALI) in 10 CFR 20 Appendix B, Table 1, Columns 1 and 2. Monitoring and dose calculations are also required when minors are likely to receive in a year a Committed Effective Dose Equivalent in excess of 50 millirems; Declared Pregnant Women, 50 millirems during the term of the pregnancy.

A bioassay is necessary whenever an individual handles, at any one time, an amount of an unsealed non-volatile radionuclide in an open area exceeding twice the ALI specified in Appendix B, Table 1, Column 2. Bioassay procedures should be initiated when operations involve handling, at any one time, >20 times the ALI in a class C chemical fume hood. Thyroid bioassays are required of all personnel handling unsealed, volatile or dispersible radioiodine in quantities exceeding 0.1 mCi on an open laboratory bench top, 1.0 mCi in a class C chemical fume hood, or 10.0 mCi in a sealed glove box. Bioassays for other isotopes require liquid scintillation counting



(LSC) of urine samples, and the urine samples should be obtained within 72 hours after handling the radionuclides. The assay consists of LSC of 1 ml of urine mixed with 15 ml of liquid scintillation cocktail.

When the calculated CEDE exceeds 10 percent of the dose limits specified in 10 CFR 20.1201 (Occupational Dose Limits), the following actions will be taken:

- a) Radiation Protection Officer will conduct an investigation to determine the cause.
- b) If the investigation indicates that further work of similar nature might result in exposure of a worker to concentrations in excess of the limit specified in 10 CFR 20.1201, the worker is restricted from further exposure until the source of the excessive exposure is discovered and corrected.
- c) Corrective action that will eliminate or lower the potential for further exposure will be implemented.
- d) A repeat bioassay will be performed within a week.

When the calculated CEDE exceeds the level specified in 10 CFR 20.1201, the following actions will be taken:

- a) Steps a — d, above, will be taken.
- b) Bioassays will be repeated at one week intervals at the discretion of the RPO.
- c) The NRC will be notified as required.

6. Procurement of Radioactive Materials. Radioactive material may be purchased or otherwise procured as transfers of licensed materials from another licensee or receipt of environmental samples that contain licensed or unlicensed quantities of radionuclides. Any individual wishing to obtain radioactive materials will obtain approval of the RPO before initiating procurement. A detailed plan for the projected use of such radionuclides, including type and amounts of materials and experimental design, will be submitted to the RPO for approval. If the items are not covered in the current license, enough time should be allowed so that application for amendment can be submitted to the NRC — three to 12 months.

- a. Purchased Materials: Requests for the purchase of all radioactive materials must be submitted to the Radiation Protection Officer for approval. Procedures for the procurement of radioactive material are:

- 1) All purchase order requests for radiation sources shall be submitted to the Radiation Protection Officer.
  - 2) Purchase requests shall minimally contain the following information: name of radionuclide, chemical form, amount in milliCuries, supplier, date of shipment, person responsible for its use, the number to which the purchase is to be charged, and approved project for its use.
  - 3) The Radiation Protection Officer shall review the purchase order to determine if the quantities of radioactive materials that are requested exceed the possession limits for that particular radionuclide, facility, and approved user. Subsequently, it will be approved and forwarded to the purchasing office.
  - 4) All radionuclides will be shipped directly to the Radiation Protection Officer, who will perform required surveys before delivery of the shipment to the user indicated on the request form.
  - 5) It shall be the responsibility of the radionuclide user to maintain a continuous inventory of each radionuclide in his/her possession and its disposition history.
- b. Environmental Samples: Samples from sites that are known or suspected to be contaminated with radionuclides will be screened and assigned to a routing category (I or II) as described in Section 17 "Exemptions."
- 1) It is imperative that attention also remain focused on the potential presence of hazardous chemicals in these samples. Each cooler or package shall be surveyed for radiation levels and for removable radionuclides if radiation levels are greater than background. Gloves shall be worn during the survey and while opening the package, also the packing material shall be monitored after opening for any leakage.
  - 2) Place the detector of a calibrated portable survey meter (reading in mR/hr) at the surface of the package and record the radiation level. Move the detector to a distance of 1 meter and record the level. As directed in 10 CFR 20.1906, any reading in excess of 200 mR/hr at the surface or 10 mR/hr at 1 meter requires immediate notification of the NRC Region I Office (215-337-5000 or 800-432-1156). In any such event, the RPO will be responsible for interim storage and handling of the package.
  - 3) If greater than background radiation levels are determined, a wipe test will be performed for the outer container. Wipe 100 cm<sup>2</sup> of the package surface with absorbent tissue or filter paper, and monitor the wipe with a calibrated portable survey meter. A reading corresponding to removable contamination in excess of 2,200 dpm per 100 cm<sup>2</sup> of the package surface requires immediate notification of the final delivering carrier and of NRC

Region I Office. In any such event, the RPO will be responsible for interim storage and handling of the package.

7. Transportation of Radioactive Materials.

a. Shipping to and from USACRREL: Before shipping and immediately after receipt of radioactive material, the RPO or alternate will complete the Radioactive Materials Movement Form DA 3252-R.

All shipments of radioactive materials shall be received by the Radiation Protection Officer or designate upon arrival at the receiving department dock. A marked and identified area has been established for the holding of the package until the survey can be completed and the package delivered to the proper laboratory area.

Shipments shall be routinely received only during normal working hours. Special arrangements to assure coverage to receive packages of radioactive materials at other times must be made through approval of the Radiation Protection Officer.

Each package shall be surveyed according to the specifications in 10 CFR 20.1906 regardless of the radionuclide or quantity of radioactive materials present except for non-dispersible forms of exempt quantities in the form of sealed sources to be utilized for instrumentation calibrations. Gloves shall be worn during the survey and while opening the package, also the packing material shall be monitored after opening for any leakage.

Place the detector of a calibrated portable survey meter (reading in mR/hr) at the surface of the package and record the radiation level. Move the detector to a distance of 1 meter and record the level. As directed in 10 CFR 20.1906, any reading in excess of 200 mR/hr at the surface or 10 mR/hr at 1 meter requires immediate notification of the NRC Region I Office (215-337-5000 or 800-432-1156). In any such event, the RPO will be responsible for interim storage and handling of the package.

Wipe 100 cm<sup>2</sup> of the package surface with absorbent tissue or filter paper, and monitor the wipe with a calibrated portable survey meter. A reading corresponding to removable contamination in excess of 2,200 dpm per 100 cm<sup>2</sup> of the package surface requires immediate notification of the final delivering carrier and of NRC Region I Office. In any such event, the RPO will be responsible for interim storage and handling of the package.

b. Moving Material within the Borders of USACRREL:

1) The material shall be transported in a closed, shatterproof container that is properly labeled.

2) The measured dose rates shall not exceed:

- a) 200 mrem/hr at any point on the external surface of the container.
  - b) 10 mrem/hr at one meter from any external surface of the package.
  - c) Removable contamination on the surface, as measured by wipe tests, shall not exceed 100 dpm/100 cm<sup>2</sup> of alpha radiation and 1000 dpm/100 cm<sup>2</sup> of beta plus gamma activity.
- 3) The transportation and transfer of radioactive material or experimental equipment containing radioactive material from one room to another must have prior approval of the RPO. During transit, the material shall be in the possession and responsible charge of an authorized user of the material.

#### 8. Storage of Radioactive Material.

- a. Radioactive material must be kept or stored in a manner which will minimize exposure of personnel. Packages and instruments must be properly marked and labeled as containing radioactive material. Either access to the material must be limited or the material/instrument must be kept in a locked space that cannot easily be transported.
- b. Radioactive material must be stored with sufficient shielding so that the radiation level at one meter from the shielding does not exceed 2.5 mR/hr.
- c. Suitable storage precautions will be taken against fire, explosion, flood or unauthorized removal.
- d. The Hanover Fire Department will be kept advised of the location of stored radioisotopes.

#### 9. Disposal of Radioactive Material. Disposal of radioactive material will be done in accordance with AR 385-11. No disposal is authorized at USACRREL.

All temporarily stored, licensed radioactive waste materials must be kept in appropriate containers that are properly labeled. In addition, the disposal of all radioactive waste must be carried out under the direction of the Radiation Protection Officer. All radioactive waste materials must be transferred to a licensed disposal site, held for decay in storage, or transferred to an approved disposal site for non-radioactive waste.

All dry waste containing radionuclides must be segregated by half-life. Dry waste containing radionuclides with half-lives of greater than 120 days should be kept separate from those materials having a half-life of 120 days or less. Collection containers should be labeled to identify the acceptable isotopes. Containers should be placed in the area where the waste material is generated and a sufficient number of containers for each isotope should be



available. The waste materials should then be collected and packaged according to isotope for the most economical and proper disposal method.

Aqueous based bulk quantities of liquid waste must be segregated from organic based bulk liquids.

Organic bulk liquids that contain radioactive materials are handled on a case by case basis and must be handled in strict accordance with the rules established by the Radiation Protection Officer. Liquid Scintillation Counting Media can be disposed of as a non-radioactive flammable liquid, if it is determined that it is in accordance with 10 CFR Part 20 Paragraph 20.2005(a), and is therefore routinely incinerated at a licensed hazardous waste facility. Specific regulations, published by the Environmental Protection Agency, Department of Transportation, and the State of New Hampshire must be followed when accumulating, packaging and transporting this type of waste. The Radiation Protection Officer will direct the handling, storage and disposal of these waste materials.

All radioactive waste materials offered for disposal must be packaged in accordance with all applicable rules and regulations published by the Nuclear Regulatory Commission, the Department of Transportation, the Environmental Protection Agency, and the internal requirements of USACRREL. Many options are available and provide different advantages. It is important to keep all personnel aware of changes in the processes that generate any type of waste materials so that the best method for collection, packaging and disposal can be selected.

Transfer of radioactive waste to a licensed disposal facility is the preferred option so long as access is available. Segregation of waste streams according to the following protocol will allow additional options.

Waste streams include liquid scintillation vials (LSV), aqueous (non-LSV) liquids (e.g., spent culture medium) and solids (e.g., laboratory trash and gels). As these wastes are generated, each may contain  $^3\text{H}$ ,  $^{14}\text{C}$ ,  $^{35}\text{S}$ ,  $^{125}\text{I}$  and/or  $^{32}\text{P}$ . Disposal options differ for each combination of waste stream and radionuclide; so, each must be segregated in the laboratory if the least costly disposal options can be exercised. The most restrictive conditions for disposal will apply to each combination. For example, laboratory trash containing  $^{35}\text{S}$ ,  $^{125}\text{I}$  or  $^{32}\text{P}$  can be held for radioactive decay and disposed of as non-radioactive material, unless the trash also contains  $^3\text{H}$  or  $^{14}\text{C}$ . Trash containing any  $^3\text{H}$  or  $^{14}\text{C}$  must be transferred to a licensed disposal facility or incinerated. The option to Decay-In-Storage (DIS) is much cheaper than burial as radioactive waste. Each waste stream will be segregated in the laboratory and transferred to our Waste Handling Facility (WHF) as appropriate for good waste management practices.

LSV containing 0.05 microCuries per gram of  $^3\text{H}$  and  $^{14}\text{C}$  may currently be shipped offsite for disposal as non-radioactive waste in accordance with Section 20.2005(a)(2).

LSV, aqueous (non-LSV) liquids and solids containing  $^{35}\text{S}$ ,  $^{125}\text{I}$  and  $^{32}\text{P}$  can be held for DIS for 10 half-lives before disposal as non-radioactive waste. All waste streams will be

held in durable, leak-proof containers. At current levels of effort, it is anticipated that waste in this category will amount to 100 mCi per year per radionuclide and will generate, on the average, less than one 55-gallon drum per month. Because of their difference in half-lives, waste containing  $^{35}\text{S}$  or  $^{125}\text{I}$  will be segregated from  $^{32}\text{P}$ . Liquids will be segregated from solids.

LSV containing  $> 0.05 \mu\text{Ci}$  of  $^3\text{H}$  and  $^{14}\text{C}$  and aqueous (non-LSV) liquids and solids containing any quantity  $^3\text{H}$  and  $^{14}\text{C}$  will be stored, pending qualification of the material for disposal. Material will be held in durable, leak-proof containers that allow the greatest number of options for further processing.

Solid waste receptacles will be placed in the laboratory. Each will be labeled SOLID WASTE and either  $^3\text{H}$ ,  $^{14}\text{C}$ ,  $^{32}\text{P}$ ,  $^{35}\text{S}$  or  $^{125}\text{I}$ ; and each will be lined with two plastic bags. Either a 5-gallon pail with crimped lid, 20- or 30-gallon fiberpacks or a 55-gallon open top drum may be used as appropriate to the volume of waste being generated and the laboratory space occupied by waste containers. When a given radionuclide is not being used, its respective waste receptacle need not be kept in the laboratory. A record will be kept of the estimated quantity of each isotope added to a container. It is not practicable to quantify exactly the quantity of radioactive material being added each time, and this approach has been approved by the NRC. In the event that it is necessary to dispose of a garment that becomes contaminated by a spill of radioactive material, cut the contaminated area out of the garment if this can be done safely, and place only the contaminated portion in the solid waste receptacle. The uncontaminated remainder of the garment may be disposed of in the regular trash. Containers must be closed when not being filled.

When containers are full or otherwise need to be removed from the laboratory, seal the container, wipe test it and transfer the full container to the WHF.

Aqueous liquid waste carboys are placed in the laboratory. Each will be labeled AQUEOUS WASTE and  $^3\text{H}$ ,  $^{14}\text{C}$ ,  $^{32}\text{P}$ ,  $^{35}\text{S}$  or  $^{125}\text{I}$  and placed in a spill pan that is lined with an absorbent pad. Either a 1-gallon container or a 5-gallon carboy may be used as appropriate to the volume of waste being generated and the laboratory space occupied by waste containers. When a given radionuclide is not being used, its respective waste receptacle need not be kept in the laboratory. A record will be kept of the estimated quantity of each isotope added to a container. It is not practicable to quantify exactly the quantity of radioactive material being added each time, and this approach has been approved by the NRC. Containers must be tightly closed while not being filled. Containers of biologically active materials may be stabilized either with Amphyl, Wescodyne or equivalent.

When containers are about 90 percent full or otherwise need to be removed from the laboratory, seal the container, wipe test it, adjust inventory records and transfer the container to the WHF. Never completely fill these waste containers. At least a 10 percent void must be left to allow for contraction and expansion.

LSV in cardboard trays are to be placed upright in containers in the laboratory. Either 55-gallon drums or 20- or 30-gallon fiberpacks will be used, as appropriate to the volume of waste in each category. Each will be labeled and lined with two plastic bags. When a given radionuclide is not being used, its respective waste receptacle need not be kept in the laboratory. A record will be kept of the estimated quantity of each isotope added to a container. It is not practicable to quantify exactly the quantity of radioactive material being added each time, and this approach has been approved by the NRC. Vials should be left in their trays (if used) and stacked upright in the fiberpack or drum. Up to 1000 vials per fiberpack are allowed; the weight limit is 75 pounds. Do not add any absorbent material. An absorbent material approved by the disposal facility will be added by the waste broker.

When containers are about 90 percent full or otherwise need to be removed from the laboratory, seal the container, wipe test it, adjust inventory records and transfer the container to the WHF.

The decayable isotopes  $^{35}\text{S}$ ,  $^{125}\text{I}$  and  $^{32}\text{P}$  can be held for 10 half-lives at the Waste Handling Facility. After this time, the waste will no longer be considered to be radioactive. The two major constraints in packaging are (1) the waste must be packaged so it can be stored safely for 10 half-lives (874 days for  $^{35}\text{S}$ , 600 days for  $^{125}\text{I}$  and 143 days for  $^{32}\text{P}$ ) and (2) the waste must be packaged so that any remaining chemical or physical hazards can be dealt with after decay. Segregation of these isotopes having a short half-life from those having long half-lives (i.e.,  $^3\text{H}$  and  $^{14}\text{C}$ ) is another critical step in this procedure. It is also important to avoid using or to remove or obliterate "Caution - Radioactive Materials" labels on vials, etc. inside the container, since the waste will be disposed of as non-radioactive after decay.

The WHF and its contents will be inspected for container integrity and surveyed for contamination on a quarterly basis. Contamination surveys will consist of direct readings with a G.M. probe and swipes of areas suspected to be contaminated either because of location or appearance. Should removable contamination be found at levels exceeding 2200 dpm/100 cm<sup>2</sup>, decontamination will be conducted. Contaminated packages that cannot be brought within the 2200 dpm/100 cm<sup>2</sup> will be over packed. Levels of fixed contamination will be maintained 2 mrem/hr. All containers in storage will be kept closed, and no airborne contamination is anticipated.

Material being held for DIS will be surveyed in a low background area for radioactivity before its final disposition. The surface of solid waste will be surveyed with a Pancake G.M. probe; liquids, by LSC. Records of surveys and final evaluations will be kept.

The WHF will be posted with appropriate caution signage, emergency instructions in case of a spill, names and phone numbers of the RPO and emergency response personnel.

Current disposal options are summarized in the following table:

Form	Isotope	Step 1	Step 2	Step 3	Step 4
LSV	$^3\text{H}$ 0.05 $\mu\text{Ci/g}$	Accumulate	Transfer to Permafix or equivalent	Incinerate	N/A
	$^{14}\text{C}$ 0.05 $\mu\text{Ci/g}$	Accumulate	Transfer to Permafix or equivalent	Incinerate	N/A
	$^3\text{H}$ >0.05 $\mu\text{Ci/g}$	Accumulate	Qualify	Transfer to Permafix or equivalent	Incinerate
	$^{14}\text{C}$ >0.05 $\mu\text{Ci/g}$	Accumulate	Qualify	Transfer to Permafix or equivalent	Incinerate
	$^{35}\text{S}$	Hold	DIS	Inspect	Discard
	$^{125}\text{I}$	Hold	DIS	Inspect	Discard
	$^{32}\text{P}$	Hold	DIS	Inspect	Discard
Aqueous Liquids	$^3\text{H}$	Accumulate	Qualify	Transfer to SEG	Incinerate
	$^{14}\text{C}$	Accumulate	Qualify	Transfer to SEG	Incinerate
	$^{35}\text{S}$	Hold	DIS	Inspect	Discard
	$^{125}\text{I}$	Hold	DIS	Inspect	Discard
	$^{32}\text{P}$	Hold	DIS	Inspect	Discard
Solids	$^3\text{H}$	Accumulate	Transfer to Barnwell	N/A	N/A
	$^{14}\text{C}$	Accumulate	Transfer to Barnwell	N/A	N/A
	$^{35}\text{S}$	Hold	DIS	Inspect	Discard
	$^{125}\text{I}$	Hold	DIS	Inspect	Discard
	$^{32}\text{P}$	Hold	DIS	Inspect	Discard



LSV containing  $0.05 \mu\text{Ci/g}$  of  $^3\text{H}$  and  $^{14}\text{C}$  will be accumulated in the WHF until a quantity is on hand that is cost effective to ship offsite for disposal as non-radioactive waste in accordance with 10 CFR Section 20.2005(a)(2). Consistent with good waste management practices, the waste broker will arrange for transportation of LSV to a disposal site.

LSV containing  $> 0.05 \mu\text{Ci/g}$  of  $^3\text{H}$  and  $^{14}\text{C}$  will be either (a) added to drums of vials having  $< 0.05 \mu\text{Ci/g}$  while keeping the average over the entire drum  $0.05 \mu\text{Ci/g}$  or (b) accumulated in the WHF until a quantity is on hand that is cost effective to ship offsite for disposal by other licensed disposal routes. Material will be held in durable, leak-proof containers that allow the greatest number of options for further processing. At current levels of effort, it is anticipated that waste in this category will amount to 50 mCi per year for  $^3\text{H}$  and  $^{14}\text{C}$  and will generate, on the average, one 55-gallon drum per year. Material that cannot be disposed of by incineration or other means will be transferred to a licensed burial site. If other approved technologies (e.g., incineration) for disposal become available, these may be used.

LSV containing  $^{35}\text{S}$ ,  $^{125}\text{I}$  and  $^{32}\text{P}$  will be held for Decay-In-Storage for 10 half-lives before appropriate disposal as non-radioactive waste. Waste will be held in durable, leak-proof containers that are held in spill trays or on containment pallets. At current levels of effort, it is anticipated that waste in this category will amount to 100 mCi per year for  $^{35}\text{S}$ ,  $^{125}\text{I}$  and  $^{32}\text{P}$  and will generate, on the average, one 55-gallon drum per month. Because of their different half-lives,  $^{35}\text{S}$  will be segregated from  $^{125}\text{I}$  and  $^{32}\text{P}$ . Containers of  $^{35}\text{S}$  will be held for 874 days after they are sealed;  $^{125}\text{I}$ , for 600 days; and  $^{32}\text{P}$ , for 143 days. After the decay period, containers will be moved to an area having low background radiation levels, opened and scanned with a Pancake G.M. probe. If measured activity is twice background, packages will be resealed and held for another half-life. Packages scanning at  $2\times$  background will be transferred to our RCRA coordinator for disposal as chemical waste.

Aqueous (non-LSV) liquids (e.g., spent culture medium and rinsate) containing quantities of  $^3\text{H}$  and  $^{14}\text{C}$  will be either (a) qualified for incineration or burial at a licensed facility. Material will be held in durable, leak-proof containers that allow the greatest number of options for further processing. Material that cannot be disposed of by incineration or other means will be transferred to a licensed burial site..

Aqueous (non-LSV) liquids (e.g., spent culture medium) containing  $^{35}\text{S}$ ,  $^{125}\text{I}$  and  $^{32}\text{P}$  can be held for DIS for 10 half-lives before appropriate disposal as non-radioactive waste. Aqueous liquid waste streams will be held in durable, leak-proof containers in spill trays or on containment pallets. At current levels of effort, it is anticipated that waste in this category will amount to 100 mCi per year for  $^{35}\text{S}$ ,  $^{125}\text{I}$  and  $^{32}\text{P}$  and will generate, on the average, one 55-gallon drum per month. Because of their different half-lives,  $^{35}\text{S}$  will be segregated from  $^{32}\text{P}$  and  $^{125}\text{I}$ . Containers of  $^{35}\text{S}$  will be held for 874 days after they are sealed;  $^{125}\text{I}$ , for 600 days; and  $^{32}\text{P}$ , for 143 days. After the decay period, samples will be collected and counted by liquid scintillation. If measured activity is greater than an exempt concentration.

packages will be resealed and held for another half-life. Otherwise, the material will be transferred to our RCRA coordinator for disposal as chemical waste.

Solid waste containing quantities of  $^3\text{H}$  and  $^{14}\text{C}$  may be accumulated and processed for offsite disposal. Material will be held in durable, leak-proof containers that allow the greatest number of options for further processing. The material will be transferred to a licensed burial site while access is available. If other approved technologies (e.g., incineration) for disposal become available, these may be used. Volume reduction techniques which may be applied in the interim may include, but are not limited to, the following: ashing onsite by plasma reduction, compaction onsite, super compaction offsite and return, and ashing offsite and return.

Solid waste (e.g., gels, paper, and gloves) containing  $^{35}\text{S}$ ,  $^{125}\text{I}$  and  $^{32}\text{P}$  will be held for Decay-In-Storage for 10 half-lives before appropriate disposal as non-radioactive waste. Solid waste streams will be held in durable, leak-proof containers on wooden pallets. At current levels of effort, it is anticipated that waste in this category will amount to 100 mCi per year for  $^{35}\text{S}$ ,  $^{125}\text{I}$  and  $^{32}\text{P}$  and will generate, on the average, one 55-gallon drum per month. Because of their different half-lives,  $^{35}\text{S}$  will be segregated from  $^{32}\text{P}$  and  $^{125}\text{I}$ . Containers of  $^{35}\text{S}$  will be held for 874 days after they are sealed;  $^{125}\text{I}$ , for 600 days; and  $^{32}\text{P}$ , for 143 days. After the decay period, containers will be moved to an area having low background radiation levels, opened and scanned with a Pancake G.M. probe. If measured activity is twice background, packages will be resealed and held for another half-life. Otherwise, the material will be transferred to our RCRA coordinator for disposal as laboratory or chemical waste.

External radiation surveys of the WHF will be conducted quarterly. If a radiation level of more than 5.0 mrem/hr at 1 meter is found, the area affected will be posted "Caution - Radiation Area." Radiation levels at various points in the WHF will be recorded on a drawing of the area.

Surface contamination surveys of the WHF will be conducted quarterly. The contamination survey will include wipe tests using filter paper, Acme smear pads, or equivalent. Wipes will be evaluated by liquid scintillation counting.

10. Emergency Procedures. The RPO must be notified immediately in the event of an accidental release of radioactive material or an external radiation exposure in excess of limits specified in 10 CFR Part 20. In addition to the procedures below, see CRREL 385-1-2 Appendix C for emergency involving moisture probes and Appendix D for emergencies involving radioactive contamination with or without injury.

The following steps are recommended for minimizing the impact of accidental releases of radioactive material:

- a. Minor Spills: Minor spills typically involve less than 1 microCurie of radioactivity.

- 1) Notify: Inform all personnel in the area that a spill has occurred and immediately call the Radiation Protection Officer.
- 2) Prevent Spread: Cover the spill with absorbent pads or other absorbent material.
- 3) Identify the Area: Mark off the contaminated area with chalk, marker, tape or any type of semi-permanent means.
- 4) Restrict Traffic: Limit access to the area to those assisting in the decontamination effort. Do not allow anyone to leave the area without first being monitored to be certain they are not contaminated.
- 5) Decontaminate: Start the clean-up as soon as possible. Use disposable gloves and if available, long handled tongs. Begin at the periphery of the area and work inward, systematically reducing the contaminated area. Carefully insert the absorbent material into a plastic bag and dispose of as dry radioactive waste. Dispose of the other contaminated items in a similar manner.
- 6) Survey: Use a thin-window survey meter to identify the radiation levels of the area and perform a wipe test of the area to monitor the effectiveness of the decontamination procedure. The maximum radiation level of the area should be very similar to that of the routinely acceptable levels (usually not greater than 0.5 mR/hr). The maximum permissible level of residual removable contamination is 200 dpm/100 cm<sup>2</sup>.

b. Major Spills:

- 1) Clear the Area: Notify all persons present to vacate the room.
- 2) Notify: Report the spill to the area supervisor.
- 3) Prevent Spread: Cover the spill with absorbent pads or other material, but DO NOT attempt to clean it up. Confine the movement of all potentially contaminated personnel
- 4) Secure Area: Leave the room and secure the door(s).
- 5) Call For Help: Notify the Radiation Protection Officer and request assistance. Office: (60
- 6) Decontaminate Personnel: Remove contaminated clothing and place in a plastic bag. Refer to the following section for skin decontamination.

c. Personnel Decontamination:

1) Wash: Wet the skin thoroughly and apply detergent. Do not use abrasive, highly alkaline soaps or organic solvents. Work up a full lather and keep it wet. Wash contaminated area two (2) to three (3) minutes being careful not to spread contamination.

2) Rinse: Thoroughly rinse with lukewarm water.

3) Monitor: Test the effectiveness of the decontamination efforts using an appropriate survey meter.

4) Repeat: Repeat the procedure up to three (3) to four (4) times, using a soft brush but only if necessary. Be careful to avoid irritation of the skin.

Consult with the Radiation Protection Officer whenever personnel become contaminated so that he can make an assessment of the radiological hazard. This is especially important if excessive radiation levels are still present. Excessive is defined for this use as greater than 0.1 mR/hr at two cm.

5) Protect Skin: Apply lanolin or other protective cream to prevent chapping or other irritations to the skin.

If the contamination is in a chemical solution which might react with the skin, immediately dilute it with water. Two chemical agents, titanium dioxide and potassium permanganate, have consistently proven useful for decontamination. Swabbing with titanium dioxide paste (lanolin slurry) removes contamination lodged under scaly surface skin. The permanganate solution (saturated) dissolves that which is absorbed in the epidermis, removing a minimum of protective skin. Sodium bisulfite (4% aqueous solution) decolorizes the permanganate stain. Detergents, wetting agents and cornmeal based soaps may be employed instead of bar or liquid soap. A two percent solution of salicylic acid in ethyl alcohol provides effective keratolytic action to remove surface skin, but this should be used only under a physician's direction. Starting with soap, then going to titanium dioxide, permanganate and bisulfite, each agent should be applied and rinsed three or four times (with radiation survey after drying) before using the next application.

11. Caution Signs and Labels.

- a. Standard. The RPO will ensure that each laboratory storing or using radioactive material is posted with appropriate signs conforming with Mil-Std-1458 and 10 CFR 20.

12. General Radiation Protection Requirements and Precautions.



- a. Laboratory Design: Each laboratory will be designed with benches, sinks, walls, and floors with smooth, non-porous, easily decontaminated surfaces. The laboratories shall be designed with a minimum amount of sharp corners, racks, or porous surfaces where radioactive material can lodge. The bench surfaces will be provided with absorbent, plastic-back, and easily discarded bench paper for catching and disposing small amounts of contamination from drips or spills from laboratory apparatus and glassware. Each laboratory shall be provided with adequate lighting to avoid spills and other radiological accidents which could result in the spread of contamination.

The laboratories will be provided with specially labeled containers for radioactive wastes. These containers shall be placed near the waste generating areas but distant from the areas frequently occupied by personnel.

Special sinks shall be designated to receive small amounts of radioactive washings or effluents. Records of estimated amounts of radioactive disposal in these sinks shall be maintained to ensure compliance with Section 20.303 of 10 CFR Part 20. The disposal limit of each radioactive isotope used in each laboratory will be determined by the RPO. These sinks should be connected to the main pipes in a manner not to have any open channels or devices which could result in the accumulation of radioactivity. Sink faucets shall be designed, where possible, for operation by foot, knee, or elbow rather than by hand.

A separate storage area shall be provided for laboratory coats and under no circumstances shall personal coats and belongings be stored with the laboratory coats. Personal belongings shall be stored outside the laboratory or far away from the areas where radioactive materials are handled to prevent possible contamination.

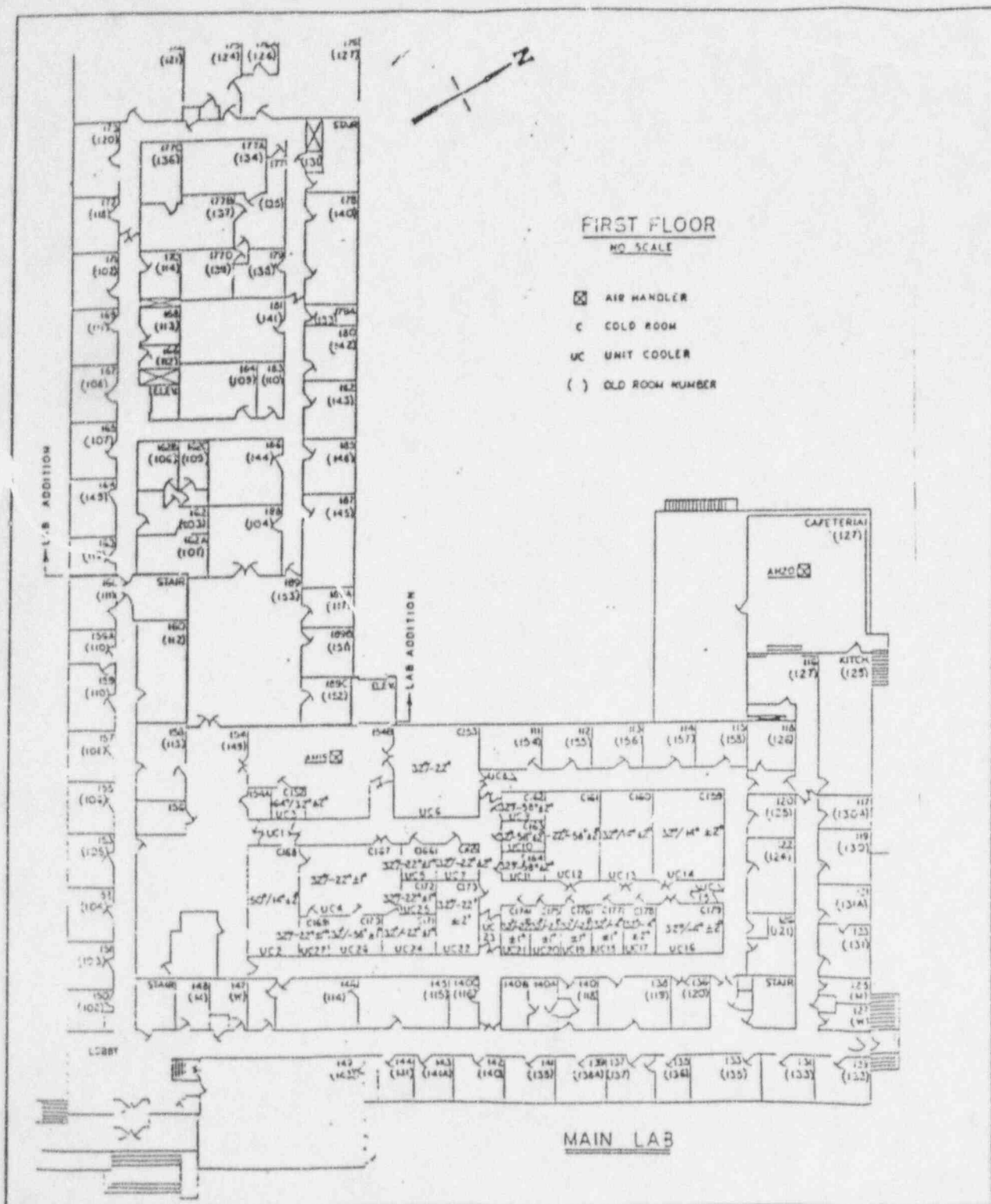
Fume hoods shall be provided in each of the preparation laboratories. These hoods shall be used only for the handling of volatile radioactive material for personal protection, not for the routine dilutions and exhaust of effluents produced by evaporation or unplanned releases. It is not anticipated that radioactive material will be handled in concentrations or forms that would require monitoring of fume hood effluent.

Each fume hood shall have its own exhaust system to avoid transmission of airborne contamination to other laboratories. Each fume hood shall also be checked at a frequency not to exceed six months for a minimum acceptable face velocity of 100 linear feet per minute.

Initially, radioactive materials will be used in three laboratories of the main building: Rooms 181, 184, 140a-b, 48 and 177. Room 140a-b is being renovated to make it suitable for radioisotope studies. Functions and equipment planned for these rooms are indicated in the table below.

ROOM	FUNCTION	EQUIPMENT
181	Soil experimental setup, sieving, spiking, weighing, mixing, column studies, column breakdown, respiration	Respirometer, oven, pH meter, computer terminal, bubble-respirometer, temperature baths, chemical fume hoods
184	Microbial preparation, plating, RT incubators, microbial inoculations	Refrigerators, centrifuge, autoclave, remote computer, plating table, incubators
140 Complex 140, 140a, 140b	Instrumental analysis, organic analysis, GC, GCMS, HPLC, LSC	GC, GCMS, HPLC, LSC
48	Soil extractions, carbon analysis, nutrients	SFE, sonic horns, filter racks, CNS-2000
177 Cold room	Cold room incubations	Plant/soil growth racks

Location of these rooms within the Main Laboratory building is given on the following floor plans:







b. General Rules for Safe Use of Radionuclides. The following work habits are particularly important in ensuring ALARA exposures:

- 1) Wear appropriate personnel monitoring devices at all times while in areas where radioactive materials are used or stored. Body monitors should be worn at waist or chest levels.
- 2) Wear laboratory coats or other protective clothing at all times in areas where unsealed radioactive materials are used. This protective clothing will not be worn outside of the controlled area.
- 3) Wear disposable gloves at all times while handling unsealed radioactive materials.
- 4) Monitor hands, shoes, and clothing and immediate area surrounding the work station for contamination after each procedure and before leaving area.
- 5) Do not eat, drink, smoke, or apply cosmetics in any area where radioactive materials are stored or used.
- 6) Never pipette radioactive material by mouth.
- 7) Dispose of radioactive waste only in specifically designated containers.
- 8) Do not store food or beverages in any area where radioactive material unsealed sources of radioactive material are being used or transferred unless otherwise authorized by the Radioisotope Safety Committee.
- 9) Avoid contaminating objects such as telephones, light switches, water tap handles, doorknobs, etc.
- 10) Handle sources of radioactive material with tongs or tweezers if appropriate to the operation.
- 11) Use easily discarded absorbent pads, absorbent on the top surface only, for containing and easily disposing of small amounts of contamination.
- 12) Whenever possible new procedures should first be performed with non-radioactive materials in order to discover and remedy potentially hazardous aspects of the procedure and to train personnel in the safe and efficient execution of the technique.
- 13) As general practice, procedures involving radioactive material should be confined to as small an area of a laboratory as is realistic, thus limiting the affected area in cases of accidental contamination.
- 14) The storage and use of radioactive materials in uncontrolled areas are prohibited.

15) All containers holding radioactive material, except as provided by 10 CFR 20.1905, shall bear a durable, clearly visible label identifying the radioactive contents. These labels shall bear the radiation caution symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL". It shall also provide sufficient information to permit individuals handling or using the containers, or working in the vicinity thereof, to take precautions to avoid or minimize exposure.

16) The inter-laboratory transportation of radioactive material shall be carried out using a closed uncontaminated container. The container shall be labeled to indicate isotope, activity and user identity.

17) A suitable remote handling device must be used for a source or container which emits a dose rate, as measured at 10 cm, in excess of 1 R/hr. Such handling shall be practiced with a non-radioactive device that simulates the source in order to identify possible problems with the planned procedure.

18) When performing operations which might produce airborne contamination (e.g., evaporations, sanding or grinding, transfer of powders<sup>1</sup> or volatile material), approved ventilation must be used.

19) Material and equipment will be surveyed and wipe tested prior to removal from a potentially contaminated area. This requires the measurement of radiation levels of items or materials prior to their use or introduction to the area that could become contaminated.

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM  
AND  
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)  
INFORMATION FROM LTS  
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: PROGRAM CODE: 03121  
: STATUS CODE: 0  
: FEE CATEGORY: EX 3P  
: EXP. DATE: 20000731  
: FEE COMMENTS: V  
: DECOM FIN ASSUR REQD: N  
: .....

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED

APPLICANT/LICENSEE: ARMY, DEPARTMENT OF THE  
RECEIVED DATE: 960102  
DOCKET NO: 3021063  
CONTROL NO.: 122729  
LICENSE NO.: 28-07946-06  
ACTION TYPE: AMENDMENT

2. FEE ATTACHED

AMOUNT: -----  
CHECK NO.: -----

3. COMMENTS

SIGNED  
DATE

*Brown, R. J.*  
*7/3/96*

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED /\_\_/) )

1. FEE CATEGORY AND AMOUNT: -----

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:

AMENDMENT -----  
RENEWAL -----  
LICENSE -----

3. OTHER -----  
-----

SIGNED  
DATE

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