phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com

TRACE

the science of compliance

January 3, 2008

Materials Licensing Branch
U.S. Nuclear Regulatory Commission, Region III
2443 Warrenville Road, Suite 210
Lisle, IL 60532-4352

RE: Application for Material License

Enclosed are two copies of the Application for Material License for Trace Analytical Laboratories, Inc. Also included is our check for $1400.

If you have any questions regarding this application, I may be reached at 231-773-5998, Ext. 239.

Sincerely,

R. Bruce Pelletier

R. Bruce Pelletier
President

Enclosures

NRC FORM 313 (10-2005) 10 CFR 30, 32, 33, 34, 35, 36, 39, and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIAL LICENSE

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.

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

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

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)*

- [X] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [ ] C. RENEWAL OF LICENSE NUMBER _____

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

TRACE ANALYTICAL LABORATORIES, INC
2241 BLACK CREEK ROAD
MUSKEGON, MI 49444

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

TRACE ANALYTICAL LABORATORIES, INC.
2241 BLACK CREEK ROAD
MUSKEGON, MI 49444

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

R. BRUCE PELLETIER

TELEPHONE NUMBER

(231) 773-5998 EXT. 239

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 "P" BYPRODUCT | AMOUNT ENCLOSED $ 1400.00

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
R. BRUCE PELLETIER	R. Bruce Pelletier	12/27/07

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			$		
APPROVED BY				DATE	

TABLE OF CONTENTS

I. INTRODUCTION:

Trace Analytical Laboratories, Inc. is a single location environmental laboratory located in Muskegon, Michigan, providing analytical services for both private industry and governmental agencies. Trace typically analyzes water, soil and air samples for a variety of volatile, non-volatile and metal analytes. The laboratory is composed of three sections: 1) Wet Chemistry, 2) Metals, and 3) Organics. Trace anticipates analyzing samples containing low-level radioactive isotopes for these categories of constituents. While the laboratory will scan incoming shipments of samples for low levels of radiation, it does not have the capacity or desire to provide radiation testing as an offered service.

II. CONTACT INFORMATION:

Address:	2241 Black Creek Road Muskegon, Michigan 49444
Main Contact:	Bruce Pelletier (RSO)
Phone:	(231) 773-5998 Ext. 239
Fax:	(231) 773-6537
Email:	bpelletier@trace-labs.com
Secondary Contact:	Jon Mink (Assistant RSO)
Phone	(231) 773-5998 Ext. 241
Email:	jmink@trace-labs.com

III. RADIOACTIVE MATERIAL TO BE POSSESSED

Samples submitted for environmental testing may be in the form of solids, liquids, or gases and may possess a variety of different radioactive elements or isotopes. This application is for authorization to possess and use any form of byproduct material, NORM and NARM with atomic numbers ranging from 3 through 96.

. The maximum total cumulative quantity of radionuclides we will possess at any one time is 100 millicuries.

IV. RESPONSIBLE INDIVIDUALS

A. Radiation Safety Officer

Bruce Pelletier will be the Radiation Safety Officer (RSO) for Trace Analytical. Bruce is a certified HAZMAT Radiation Technician and has received in excess of 80 hours of formal radiation safety training. This includes the successful completion of a 40-hour NORM Radiation Safety Officer Class (Resume in Appendix A.)

Bruce is a degreed Chemist and Co-owner of Trace Analytical Laboratories. He has 30+ years of experience working with hazardous waste in the analytical, storage and

disposal fields. Additionally, he is a State of Michigan Certified Hazardous Materials training instructor (Training Certifications in Appendix B.) In this capacity, he has taught many Hazardous Materials Technician, Operations, Awareness and Train-The-Trainer courses to fire departments, police agencies and EMS personnel.

Bruce will be in charge of employee training as well as overseeing the radiological conditions during activities performed under this license. As Radiation Safety Officer, he will have the authority to stop work at any time and will coordinate with employees so that all work can be accomplished in a safe and radiological sound manner.

Jon Mink will be designated as the secondary Radiation Safety Officer (Assistant RSO) to fill the duties and responsibilities of Radiation Safety Officer in Bruce's absence. Jon has a considerable level of experience working with radioactive materials at USC (Resume in Appendix A.)

An organizational chart of the company's administrative and laboratory staff has been included on the following page.

B. Responsibilities of the Radiation Safety Officer

1. The RSO shall be responsible for the radiological aspects of sample receipt, analysis, storage, return, and disposal.

2. The RSO shall be responsible for the radiological aspects of analytical check sources, their receipt, storage, use and disposal.

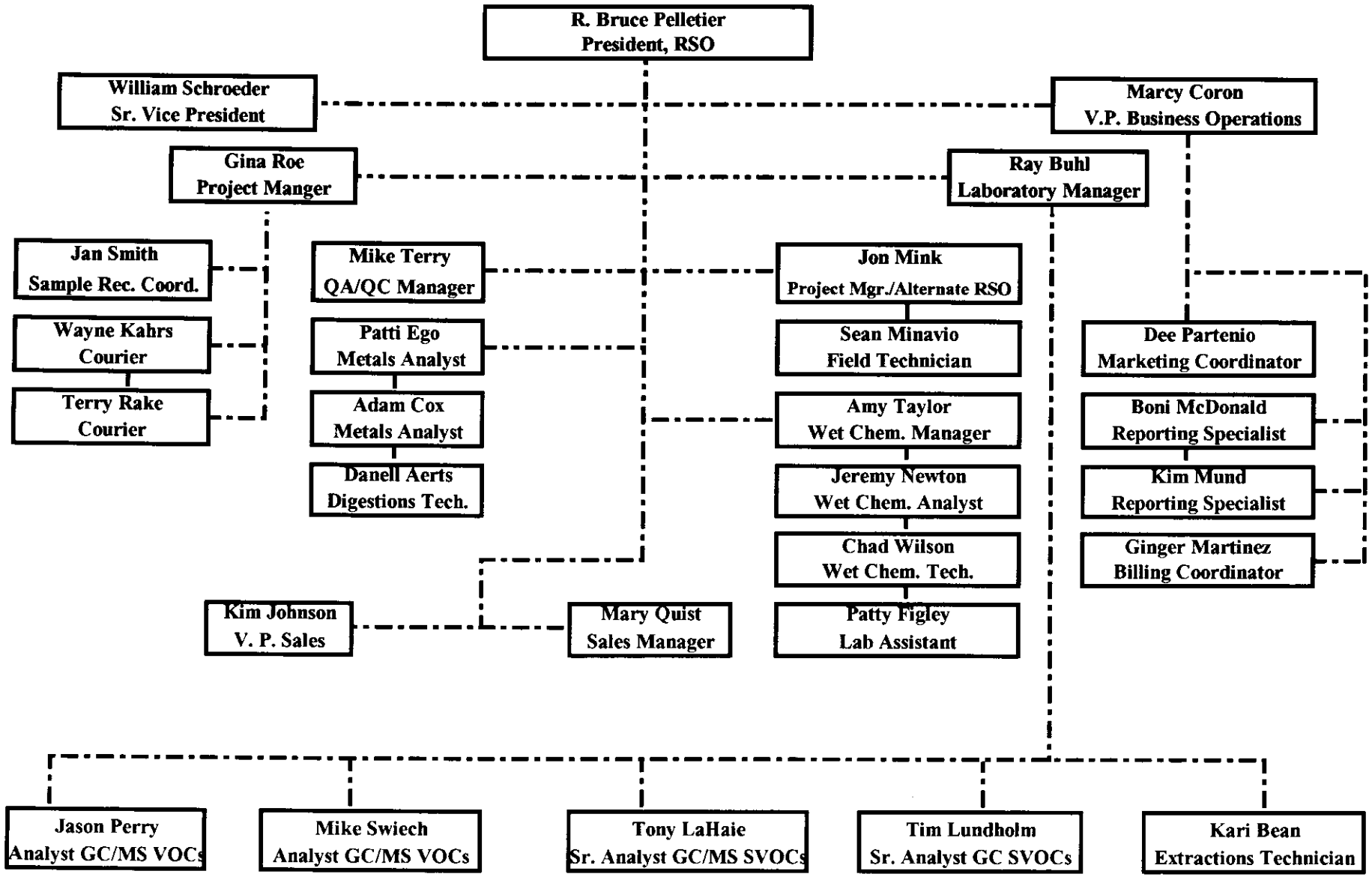
3. The RSO will be responsible for all radiological postings. He will ensure that all applicable areas are properly posted in accordance with this license and 10CFR20.1901 & 1902. The RSO will be responsible for posting of "Notices to Workers," as required by 10CFR19.12.

4. The RSO shall, at intervals not to exceed 12 months, review the radiation protection content and implementation of the Trace Analytical radioactive material license and support procedures. Records of these reviews shall be maintained for three years after the review was made.

5. The RSO shall be responsible for the implementation of Trace Analytical's dosimetry program. Records of personnel dosimetry monitoring shall be maintained in accordance with 10CFR20.2106.

6. The RSO shall ensure that radiation, contamination, and airborne radioactivity surveys required by Trace Analytical's radioactive material license and support procedures are performed. Records of surveys shall be maintained in accordance with 10CFR20.2103.

TRACE ANALYTICAL LABORATORIES ORGANIZATIONAL CHART



7. The RSO shall ensure that calibrations of survey instruments used to assess radiological conditions are performed as required by the Trace Analytical radioactive material license and support procedures. Instrument calibration intervals shall be in accordance with 10CFR20.1501. Records of instrument calibrations shall be maintained in accordance with 10CFR20.2103.

8. The RSO shall ensure that personnel working with radioactive material have received radiation protection instruction. Instruction, as a minimum, shall meet the requirements of 10CFR19.

9. Before using licensed material, authorized users will receive the training described in Section 4.3 of this application and Appendix H in NUREG-1556, Vol. 18, "Consolidated Guidance About Materials Licenses: Program-Specific Guidance About Service Provider Licenses, dated November 2000."

10. Before using licensed materials, ancillary personnel will have successfully completed the classroom-training portion of the training course described in Appendix H in NUREG-1556, Vol. 18. Ancillary personnel will be glassware washers, clerical and building maintenance personnel.

11. The RSO shall ensure that radioactive material is disposed in accordance with Trace Analytical's radioactive material license and support procedures. Disposal of radioactive material shall be in accordance with disposal procedures outlined in 10CFR20, Subpart K. Records of waste disposal shall be maintained in accordance with 10CFR20.2108.

12. The RSO shall ensure that the transportation of radioactive material initiated by Trace Analytical is in accordance with 49CFR, Parts 170-178.

13. The RSO shall be responsible for notifications of incidents. Notifications of incidents shall be in accordance with the Trace Analytical radioactive material license and support procedures, and 10CFR20.2201 through 2205.

C. Radiation Safety Training Program

All Trace Analytical employees entering a Restricted Area shall be trained as outlined in 10CFR19.12. This training shall consist of a minimum of eight hours classroom instruction and an examination. The following outline contains the minimum instruction requirements contained in 10CFR19.12.

1. All individuals working in or frequenting any area where sources of radiation are present, used, or stored shall be kept informed of the storage, transfer, or use of sources of radiation or radioactive materials in such portions of the area 10CFR19.12.

2. All individuals working in or frequenting any area where sources of radiation are present, used, or stored shall be instructed in the health protection problems associated with exposure to such radioactive material or radiation (including the biological risks to an embryo or fetus), in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed, when applicable. (10CFR19.12.a.2.)

3. All individuals working in or frequenting any area where sources of radiation are present, used, or stored shall be instructed of the responsibility to report promptly to the RSO any condition that may constitute, lead to, or cause a violation of applicable NRC radiation protection regulations or which may cause unnecessary exposure to radiation or radioactive material.

4. All individuals working in or frequenting any area where sources of radiation are present, used, or stored shall be instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation or radioactive material. An example of such an occurrence would be a spill or fire involving radioactive material.

5. All individuals working in or frequenting any area where sources of radiation are present, used, or stored, who have worn dosimetry for purposes of personnel dose monitoring, shall be advised as to the radiation exposure reports that workers shall be furnished.

6. Training will include the use of visual aids such as PowerPoint, videotape segments, and hands-on instruction.

7. Personnel will be required to demonstrate, through written and practical testing, knowledge of radiological controls, radioactive material handling procedures, emergency procedures and use of survey instrumentation (10CFR19.12, 10CFR20.1101.a.)

8. Visual aids, such as overhead projections, survey instruments, computer training programs, and textbooks will be used when performing this instruction. Survey training shall include "hands on practical factors," such as the taking and counting of a smear, measurements of radiation levels from various objects, the interpretation of instrument readings, and personnel monitoring or "frisking" for contamination.

9. Personnel shall demonstrate understanding of radiological controls, radioactive material handling procedures, emergency procedures, and use of survey instrumentation (10CFR19.12, 10CFR20.1101.a.)

10. Personnel dealing with radioactive waste management and materials shipping will be trained in waste management, shipping accumulated waste, and radioactive material control (49CFR172 Subpart H.) Trace will have no more than four (4) 55-gallon drums of on-site waste at any time.

11. Personnel working in the vicinity of radioactive materials will receive both initial and annual refresher training to include the following topics:

a. The Atom and Radioactive Decay
b. Radiation Terms and Units
c. ALARA and Radiation Protection Techniques
   - Time
   - Distance
   - Shielding
d. Risks and Biological Effects of Low Level Radiation
e. Methods of Protecting Against Radiation and Contamination
f. Respiratory Protection
g. Prenatal Radiation Risks and Declaring a Pregnancy
h. Radiation Detection Equipment
   - Survey meters
   - Personal dosimetry devices (OSL, TLD.)
i. Calibration and operation of meters
j. Radiation survey techniques for measuring removable/fixed contamination
k. Proper use of personal protective clothing and equipment (PPE)
l. Decontamination procedures
m. Applicable NRC regulations (10 CFR 19, 20, 21, 31, 32, 34, 35, 36, 39, 40, 70 and 71.
n. Limitations of survey equipment
o. Record keeping
p. Proper disposal procedures

13. Each employee shall be evaluated on his or her level of radiation safety knowledge and practical abilities. Employees must pass both a written and practical skills exam with a score of 70% or better. Employees not passing the examinations will receive additional training as determined by the instructor. Additionally, the instructor will review all incorrect answers with employees to ensure they are knowledgeable in the subject material.

14. Training shall be accomplished by the RSO of Trace Analytical Laboratories, Inc., or another company or individuals recognized as having sufficient experience, knowledge, and skills to conduct such training. Records of personnel training and qualifications shall be maintained for a minimum of five years.

V. ALARA PROGRAM

A. The management staff at Trace Analytical is committed to maintaining exposures to ionizing radiation As Low As Reasonably Achievable (ALARA.) The following steps will be employed to achieve Trace's ALARA policy:

B. Trace will use sound radiation protection principles, procedures and engineering controls to achieve occupational and public doses that are ALARA. Fundamental to these principles will be the concept of Time, Distance and Shielding.

C. Trace will instill the principles and practices of ALARA to all its employees.

D. The Radiation Safety Officer shall have authority to implement and upgrade radiation safety procedures and to stop unsafe work practices.

E. Trace employees will be empowered to halt work activities whenever they believe unsafe conditions exist or when work conditions do not meet the ALARA philosophy.

F. Training of workers, periodic audits of safety procedures, record keeping, surveys, and environmental monitoring shall be performed as described in this license application.

G. Trace will control air emissions of radioactive material to the environment from its sample preparation and testing activities so that no individual member of the public will be likely to receive a total effective dose exceeding ten millirem (mrem) per year (10CFR20.1101.)

H. Trace will provide personnel dosimetry to all employees who work with or may come in contact with radioactive samples. The Radiation Safety Officer will initiate an investigation of any personnel receiving a total dose in excess of 100 mrem per year to determine the cause of the exposure. Based on the findings of this investigation, corrective action programs will be developed to reduce or eliminate the probability of recurrence.

I. Trace shall maintain compliance with (10CFR20.1101) and all other applicable portions of (10CFR20.)

J. A review of the radiation safety program will be conducted annually by the Radiation Safety Officer to ensure the adequacy of the program to meet the ALARA objective and to assess the program's compliance. Information from this review will be discussed with management staff (10CFR20.1101.) Documentation of the program review will also be maintained in accordance with (10CFR20.2102.)

VI. RECORD KEEPING

A. Permanently, or until license termination:

Dosimetry records required by (10CFR20.2106.)

Radiation surveys showing compliance with general public annual dose limits.

Disposal of radioactive material, when required by (10CFR20.2108.)

B. Records kept for 3 years

Survey instrument calibration records, when required by (10CFR20.2103.a.)

Laboratory analysis records, when required by (10CFR20.2102, 2103.)

Radiation and contamination surveys, when required by (10CFR20.2103.)

Audits and reviews of the Radiation Protection Program, when required by (10CFR20.2102.)

Shipping manifest forms.

C. Records kept for 5 Years

Leak test records, when required.

Personnel training and instruction records, when required by (10CFR20.2102.)

Records shall be maintained in a legible manner throughout the retention period. The record shall be the original or a reproduced copy. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, and specifications shall include all pertinent information, such as stamps, initials, and signatures.

VII. FACILITIES AND EQUIPMENT:

Trace Analytical Laboratory is maintained within a 10,000 ft. building, located in Muskegon, Michigan. The building is divided into six major discipline areas: Volatiles, Semi-volatiles, Metals, Wet Chemistries, Sample Receiving, and administrative offices. All samples coming into the facility must first be processed by our sample receiving department. This is a 12' X 22' room that is adjacent to the

client parking area. Clients proceed directly from the parking area into the sample receiving area. It is here where samples are unpacked from shipping containers and are screened for appropriate preservation parameters, i.e.,. pH, temperature, etc. This is also the location where chain-of-custody forms are reviewed for completeness and work orders are entered into Trace's LIMS system. A fume hood is located in this area for sample containers that are broken or may have a detectible odor. It is at this location where all incoming sample shipments will be surveyed for levels of radiation, by wipe smear, prior to the unpacking of any containers. All laboratory and sample preparation areas are isolated from the support areas of the building by keyless entry systems.

A diagram of the building's layout has been included on the following page of this application.

Trace has two (2) Ludlum Model 3 survey meters. One meter is equipped with a 44-9 probe (Pancake Probe.) The meter face reads from 0 to 5,000 cpm (counts per minute.)

The other survey meter is a Ludlum Model 3 with a 44-2 (1" x 1" NaI Scintillation Probe.) The meter face of this instrument reads from 0 to 5,000 microRoentgens per hour (uR/hr.)

The calibrations of these survey meters shall be checked daily against a 1 uCi (microcurie) Cesium-137 1" plastic check source. This was purchased from Ludlum Measurements, Inc.

Trace laboratories also has four (4) SKC portable air sampling pumps that collect from 0 – 10 Liters per minute with a 47 mm paper filter holder.

Trace also has a high volume GAST air-sampling pump that is capable of sampling at a rate of 0-2 ft./minute with a 47 mm paper filter holder.

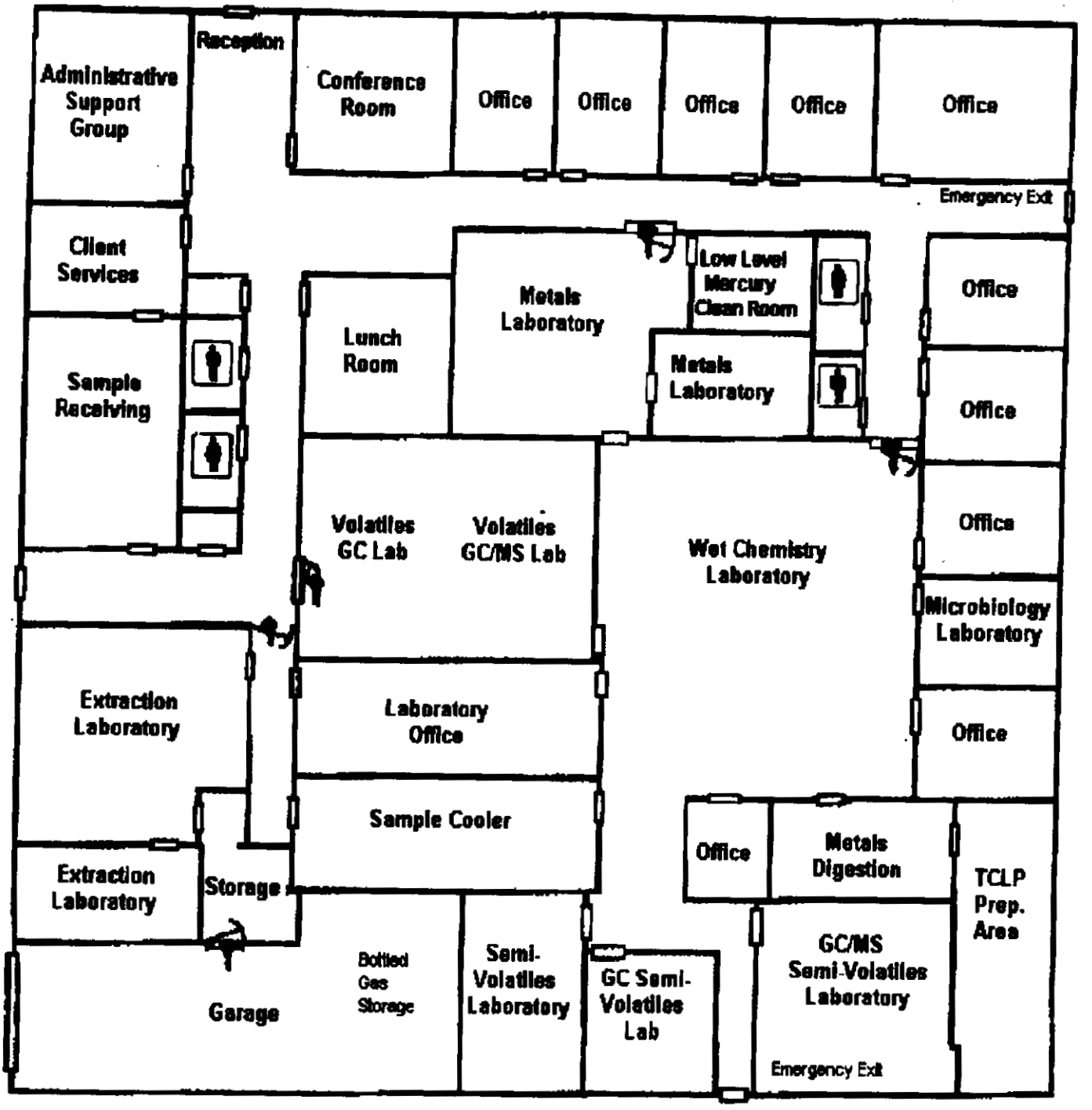
Trace maintains a supply of both latex and nitrile gloves for the protection of its analysts. A supply of both full face and half mask respirators is also available for respiratory protection. A stock of long sleeved Tyvek coveralls is maintained for employee use when needed.

VIII. HEALTH PHYSICS PROGRAM

A. Area Posting Requirements

Areas of radioactive material handling and contamination will be posted with appropriate caution signs in accordance with 10CFR20.1902 and 10CFR20.1904. The signs will bear the conventional radiation colors (magenta, purple or black on a yellow background) and the three-blade tri-foil design.

TRACE ANALYTICAL LABORATORIES, INC.



Postings will be of a size and quantity as to properly alert personnel in the area of the radiological hazards. All radiological postings will be conspicuously posted so that personnel engaged in work activities in the area can readily view them. When possible, the size of the posted area will be limited to the immediate area of concern, rather than posting large non-specific areas. This will provide more specific worker guidance while limiting the chance of causing undue worker or public alarm.

B. Restricted Area

Any area/access which is controlled by Trace Analytical for purposes of protection of individuals from exposure to radiation and radioactive materials, will be posted "Caution: Restricted Area."

The maximum dose rate allowed at the boundary of a Restricted Area is 2 millirem per hour (mrem/hr), or an exposure rate which could result in a member of the general public receiving greater than 100 millirem per year (mrem/yr), whichever is more restrictive.

A Restricted Area is defined as "any area, access to which is controlled by the licensee for the purpose of protection of individuals from exposure to radiation and radioactive materials."

The postings will be conspicuous and shall be replaced if they become damaged or unreadable.

C. Radiation Area

Areas, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 5 mrem in one hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates, or in any 5 consecutive days a dose in excess of 100 mrem, shall be posted "Caution: Radiation Area." The posting shall bear the conventional radiation tri-foil symbol.

D. High Radiation Areas

Trace will not be working with materials that would result in "High Radiation Areas" or "Very High Radiation Areas."

E. Airborne Radioactive Materials

An area, room, or enclosure will be posted "Caution: Airborne Radioactive Materials" when airborne radioactive materials exist in concentrations:

1. in excess of the derived air concentrations (DACs) specified in 10CFR20, Appendix B, Table I; or

2. to such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours.

F. Radioactive Materials Area.

Each area or room in which there is used or stored an amount of licensed or registered source of radiation exceeding ten times the quantity of such source of radiation specified in 10CFR20, Appendix C will be posted with a conspicuous sign or signs bearing the radiation symbol and the words "Caution: Radioactive Material(s)."

G. Temporary Storage Areas

In the event Trace Analytical designates an area as a temporary "Radioactive Material Storage Area," the designated storage area will be posted with a conspicuous sign or signs bearing the radiation symbol and as a minimum the words "Caution: Radioactive Materials, Restricted Area."

H. Exceptions to Posting Requirements

Caution signs are not required to be posted in areas or rooms containing sources of radiation for periods of less than eight hours if the sources of radiation are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to sources of radiation in excess of the limits established in 10CFR20.

I. Deposting Areas

1. Deposting a Restricted Area

Prior to deposting a Restricted Area, the following actions must be completed.

a. All trash or waste generated must be surveyed for release or placed in a proper waste receptacle.
b. Equipment, sinks, vent hoods, counter areas, and floors shall be surveyed for removable contamination and found to be less than 1,000 dpm/100cm^2 for gamma and beta emitters, and 220 dpm/100cm^2 for alpha emitters.
c. Exposure rates in the area will be less than those that define a Restricted Area, as defined in section VIII, B..
d. Exposure rate and removable contamination surveys will be documented.

2. Deposting a Radiation Area

A survey will be conducted and documented showing exposure rates in the area are less than those that define a Radiation Area, as defined in section VIII, C.

3. Deposting an Airborne Radioactive Area

Air sampling will be conducted and documented showing airborne radioactive material levels less than those that define an Airborne Radioactive Area, as defined in section VIII, E..

4. Deposting a Radioactive Material Area

An examination of the area or room will be performed and documented showing that radioactive material is not present in quantities greater than those that define a Radioactive Material Area, as defined in section VIII, F..

J. Labeling of Containers

Trace Analytical will ensure that each container of licensed or registered source of radiation be labeled with a durable, clearly visible label bearing the radiation symbol and the words "Caution, Radioactive Material" or "Notify Trace Analytical." The label should also provide applicable information, such as an estimate of the quantity of radioactivity, the date for which the activity is estimated, radiation levels, and kinds of materials, to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposures.

Prior to the removal or disposal of empty uncontaminated containers to unrestricted areas, workers will remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials. (10CFR20.1904.b)

K. Exceptions to Labeling Requirements

Labeling of containers is not required when:

1. Containers hold licensed or registered sources of radiation in quantities less than the quantities listed in 10CFR20, Appendix C;
2. Containers hold licensed or registered sources of radiation in concentrations less than those specified in 10CFR20, Appendix B, Table 3;
3. Containers are attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established in 10CFR20;
4. Containers when they are transported and packaged and labeled in accordance with the regulations of the U.S. Department of Transportation;

L. Personnel Protective Clothing

1. All personnel working with loose radioactive material greater than 1,000 dpm/100cm^2 beta gamma, or 220 dpm/100 cm^2 alpha shall, as a minimum, wear a laboratory overcoat, gloves and protective safety glasses.

2. Personnel receiving sample material will, as a minimum, wear gloves until the exterior surface of the sample container has been verified free of removable contamination. Personnel involved in sample preparation shall, as a minimum, wear a laboratory overcoat, gloves and protective safety glasses.

VIV. DOSE MONITORING – OCCUPATIONAL WORKERS

A. Occupational Dose Limits

Trace Analytical shall control the occupational dose to individual adults to the following dose limits:

1. an annual limit, which is the more limiting of:

    a. the total effective dose equivalent being equal to 5 rem; or
    b. the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rem; and

2. the annual limits to the lens of the eye, to the skin, and to the extremities, which are:

    a. lens dose equivalent of 15 rem; and
    b. a shallow dose equivalent of 50 rem to the skin or to any extremity.

The assigned deep dose equivalent and shallow dose equivalent shall be for the portion of the body receiving the highest exposure. The deep dose equivalent, lens dose equivalent, and shallow dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits contained in 10CFR20.1201, 1207, 1208, if the individual's monitoring device was not in the region of the highest potential exposure or the results of individual monitoring are unavailable.

Derived air concentration (DAC) and annual limit on intake (ALI) values specified in 10CFR20, Appendix B may be used to determine the individual's dose and to demonstrate compliance with the occupational dose limits.

Not withstanding the annual dose limits, Trace Analytical shall limit the soluble uranium intake by an individual to 10 milligrams in a week in consideration of chemical toxicity.

Trace Analytical shall reduce the dose that an individual may be allowed to receive in the current year by the amount of occupational dose received while employed by any other person.

B. Trace Analytical Administrative Dose Limits for Occupationally Exposed Adults

Trace Analytical has established administrative dose limits for occupationally exposed adults at 60 percent of the dose limits contained in 10CFR201201. Doses in excess of the Trace Analytical administrative limits shall not be allowed without prior approval from the Trace Analytical Radiation Safety Officer. The Trace Analytical administrative dose limits for occupationally exposed adults are as follows:

1. an annual limit, which is the more limiting of:

    a. the total effective dose equivalent being equal to three rem; or
    b. the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 30 rem; and

2. The annual limits to the lens of the eye, to the skin, and to the extremities that are:

    a. Lens dose equivalent of nine rem; and
    b. a shallow dose equivalent of 30 rem to the skin or to any extremity.

C. Determination of Prior Occupational Exposure

The occupational dose during the current year shall be determined for all occupational workers. Individuals for whom the current year occupational dose has not been determined shall be limited to a dose of 100 mrem.

A written, signed statement from the individual or the most recent employer may be accepted as a record of current year dose. This statement shall not include estimated doses for time periods for which a final dose value should be available.

Attempts shall be made to obtain records of lifetime dose for all personnel who are likely to receive a dose in excess of 10% of the annual regulatory dose limits. Records shall be kept of attempts to obtain lifetime dose history, including the name, address, date, and response of the individual contacted. If the lifetime dose history cannot be obtained from the current or most recent employer, each prior employer shall be contacted individually based upon information supplied by the individual.

The lack of prior year dose records shall not be the basis for any restriction on the annual dose an individual may receive.

Prior dose history shall be documented on Form NRC-4, or an equivalent form containing the same information. The prior dose history record shall show each period in which the individual received occupational dose and shall be signed by the individual who received the exposure. A written notation shall be placed on Form NRC-4 indicating any periods of time for which dose history data is unavailable.

An up-to-date Form NRC-4, or equivalent, signed by the individual and countersigned by the current or most recent employer shall be acceptable as a record of lifetime cumulative radiation dose.

Prior dose reports may be obtained by letter or electronic means. Written verification shall be requested if the authenticity of the data cannot be ascertained or the reliability is questionable.

D. External Dose Monitoring

NRC Regulations require the use of individual monitoring devices for any adult, minor or embryo/fetus likely to receive a dose in excess of ten percent of the occupational dose limits 10CFR20.1502.a.

All individuals entering a Restricted Area, with the possible exception of visitors and short term contractors (see visitor section below), shall be monitored by issuance of personnel monitoring equipment, e.g., thermo luminescent dosimeters (TLD's) or optically stimulated luminescent dosimeters (OSL's). Each dosimeter will be assigned to a specific person and shall be worn only by that person. When an employee reports to work they will attach their assigned dosimetry to their clothing and wear it throughout the workday. At the end of the workday the employee will leave his or her dosimeter in a low background location designated by the RSO. A "control" dosimeter will be kept at this location at all times and be read at the same frequency as those dosimeters worn by employees. Utmost care shall be taken to prevent dosimeter damage or loss. Each dosimeter will bear the name of the individual and/or a number corresponding to the individual assigned to it. Dosimeters will be read at intervals not to exceed three months. Records of dosimeter readings will be maintained at the office of Trace Analytical Laboratories.

Personnel monitoring equipment shall be placed at the location on the body expected to receive the highest whole body exposure. The dosimeter shall be worn on the front of the body between the neck and waist when exposure conditions will lead to a relatively uniform whole body dose. If exposure conditions will lead to non-uniform dose to the whole body, the dosimeter shall either be moved to the body location of highest dose or multiple dosimeters worn at body locations, which include the point of highest dose to the whole body.

E. Visitors and Short Term Contractors

Visitors or short term contractors (contractors working less than a total of one day) requiring entry into Restricted Areas will not be assigned dosimetry as long as the following conditions are met:

1. They do not enter areas where a major portion of their whole body could receive a dose equivalent equal to or greater than two mrem per hour, and

2. Survey documentation of the areas exists to prove that dose equivalent rates greater than two mrem per hour will not be encountered, and

3. The total amount of time spent in the Restricted Area is less than one working day (8 hours) per week.

Current year dose shall be documented prior to issuing primary dosimetry to personnel likely to exceed 10% of the applicable annual dose limit. Additionally, an attempt shall be made to document lifetime dose for those individuals; however, a primary dosimeter may be issued while awaiting lifetime dose history information requested from previous employers.

Primary dosimetry shall be processed by a laboratory or vendor maintaining accreditation by the National Voluntary Laboratory Accreditation Program (NVLAP). Primary dosimetry devices shall be capable of measuring the deep dose equivalent (DDE) at a tissue depth of one centimeter, the eye dose equivalent (LDE) at a tissue depth of 0.3 centimeters, and the skin dose equivalent (SDE) at a tissue depth of 0.007 centimeters.

4. Primary dosimeters shall be processed at a frequency directed by the RSO, not to exceed an interval of three months. Primary dosimeters may also be processed under the following circumstance.

- After routine badge exchange.
- When individual monitoring is no longer required.
- Upon employment termination.
- When over-exposure of an individual has occurred or is suspected.
- When special, non-routine circumstances (e.g. declared pregnant woman) cause the need for knowledge of an individual's current official dose.
- As directed by the Corporate RSO.

Personnel who have worn dosimetry shall be furnished a written report of their radiation exposure (in millirem) annually. Additionally, personnel who have worn dosimetry shall be furnished a written report of their radiation exposure within 30 days from the time of termination of employment, or within 30 days after the exposure of the individual has been determined, whichever is later. Personnel who

have worn dosimetry may request a written report of their exposure. The request shall be made in writing, and the report shall be supplied to the individual by Trace Analytical within 30 days of the request.

Below is a partial list of the companies providing accredited dosimetry services:

Landauer, Inc.
2 Science Rd.
Glenwood, IL 60425-1586
800-323-8830

ICN Dosimetry Service
PO Box 19536
Irvine, CA 92713
800-251-3331

F. Skin Monitoring

Skin dose rates should be minimized as much as practicable by shielding or decontamination. The non-penetrating radiation energies and dose rates should be determined and sufficient protective clothing should be used to prevent substantial skin doses.

The shallow dose equivalent to the skin from external radiation sources is monitored by the primary dosimeter. The primary dosimeter may be placed in a thin plastic bag to protect it from contamination, but the beta window shall be kept facing away from the body at all times. The primary dosimeter shall not be worn inside anti-contamination clothing or placed in pockets when any bare skin is exposed to beta radiation.

G. Internal Dose Monitoring

Trace Analytical shall monitor the occupational intake of radioactive material by and assess the committed effective dose equivalent (CEDE) (10CFR20.1502b) to:

1. adults likely to receive in one year, an intake in excess of 10 percent of the applicable ALI listed in 10CFR20, Appendix B, Table I, columns 1 and 2, and

2. minors and declared pregnant women likely to receive, in one year, a committed effective dose equivalent in excess of 0.05 rem.

Internal dose monitoring may be accomplished via bioassays or through air sampling and recording the length of time an individual stays in an area of airborne radioactivity. The RSO shall determine if bioassays are required based on the radioisotope of concern and the estimated amount of the intake.

The DAC values listed in 10CFR20, Appendix B, Table I, Column 3, shall be used when determining occupational internal dose via air sampling results. Allowance for respirator protection may be taken using the guidance contained in 10CFR20, Appendix B.

H. Bioassays

Bioassays, when appropriate and warranted, will be used to assess the intake of radioactive materials. Bioassays will be warranted and appropriate when any individual is suspected of ingesting or inhaling greater than 10% of one Annual Limit on Intake (ALI) of radioactive material in any one calendar year. This corresponds to 200 DAC-hours. ALI limits for various radioactive materials are listed in 10CFR20, Appendix "B," Table 1, Column 1 and 2.

Trace shall track individual airborne radioactivity exposures for each person exposed to show that compliance with 10CFR20.1502.a is not required. Tracking shall consist of measurement of DAC-hr exposure or fraction of ALI intake. If it is determined that compliance with 10CFR20.1502.a is required for an individual, then the Total Effective Dose Equivalent (TEDE) for that individual shall be determined. When required, the TEDE shall be calculated using guidance set forth by the U.S. Nuclear Regulatory Commission in Regulatory Guide 8.9 "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program" and Regulatory Guide 8.34 "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses." Trace may use a dosimetrist acceptable to the NRC to evaluate and interpret the assay date and determine the dose.

In the unlikely event that a bioassay is required due to an ingestion or inhalation of 10% of one ALI of radioactive material in one calendar year, a whole body count (*In Vivo* method) or other appropriate method (*In Vitro* method), i.e., urine, fecal sample collection and analysis, shall be performed. The time of sample collection following the suspected uptake shall be documented when performing *In Vitro* dose assessments. Trace shall utilize the guidance contained in American National Standard HPS N13.30-1996 (Performance Criteria for Radio bioassays) and the National Council of Radiation Protection and Measurement Report No. 65 (Management of Persons Accidentally Contaminated with Radionuclides) to determine the most appropriate bioassay measurement to be used for the uptake.

Bioassays shall be performed by American Radiation Services, or other approved Trace vendors. Any activity detected as a result of bioassay analysis shall be assumed to have come from operations conducted under the Trace radioactive material license.

Documentation of the circumstances involving the uptake and results of the bioassay shall be maintained by Trace until the NRC terminates the license. This documentation shall be made available to the NRC upon request.

The address and phone number for American Radiation Services, Inc. is as follows:

American Radiation Services, Inc.
2609 North River Road
Port Allen, LA 70767
Tel: (225) 381-2991, Fax: (225) 281-2996

I. Summation of Internal and External Doses

Internal and external doses shall be summed when required by 10CFR20.1201 & 1202. The dose to the lens of the eye, skin, and extremities are not included in the summation, but are subject to separate limits. Compliance with regulatory required summation of external doses and internal doses from intakes by inhalation shall be demonstrated by showing that one of the following conditions is met:

1. The deep dose equivalent divided by 5 rem plus the sum of the fractions of the inhalation ALI values for each radionuclide does not exceed unity; or

2. The deep dose equivalent divided by five rem plus the total number of DAC-hours for all radionuclides divided by 2,000 does not exceed unity; or

3. The deep dose equivalent divided by five rem plus the sum of the committed effective dose equivalents to all significantly irradiated organs or tissues divided by five rem dose not exceed unity. An organ or tissue is deemed to be significantly irradiated if, for that organ or tissue, the committed effective dose equivalent is greater than ten percent of the maximum committed effective dose equivalent for any organ or tissue.

Oral ingestion of radionuclides greater than ten percent of the applicable oral ALI by occupationally exposed individuals shall be accounted for and included in demonstrating compliance with the dose limits.

Intakes through wounds or skin absorption shall be evaluated and, to the extent practical, accounted for in summation of internal and external doses independent of intakes by ingestion or inhalation. The intake through intact skin is already accounted for in the DAC for hydrogen-3 (tritium) and does not need further evaluation.

J. Declared Pregnant Woman Exposure Policy

Exposure controls are established for the protection of the embryo/fetus during a female worker's pregnancy based on recommendations of the National Council on Radiation Protection and Measurements (NCRP) and on regulatory requirements. These controls shall ensure compliance with regulatory requirements and protect the rights of the female worker.

Declaration of pregnancy is entirely at the discretion of the woman (medical proof is not required.). To declare pregnancy, the woman shall inform the Corporate RSO, in writing, of the pregnancy and an estimated date of conception so that the estimated dose to the embryo/fetus prior to declaration can be determined. A woman may withdraw her declaration of pregnancy at any time and for any reason by notifying the Corporate RSO in writing. Any woman who does not declare her pregnancy shall be subject to the normal occupational dose limits and shall not be subject to special controls or treatment with respect to work assignments involving exposure to radiation even if she is pregnant.

Trace Analytical shall ensure that the dose equivalent to the embryo/fetus does not exceed the 0.5 rem per pregnancy term regulatory limit due to occupational dose. Efforts shall be made to avoid substantial variation above a uniform monthly exposure rate to the embryo/fetus of a declared pregnant woman (e.g., exposures above 50 mrem in any month should be avoided.)

A declared pregnant woman shall not be permitted to enter airborne radioactivity areas nor be assigned to tasks, which could lead to internal radionuclide intakes.

A declared pregnant woman subject to occupational exposure shall be issued a primary dosimeter and a secondary dosimeter. The secondary dosimeter shall be worn on the front lower torso of the declared pregnant woman.

K. Medical Radionuclide Intakes

Occupational exposure does not include exposure due to medical administration of radionuclides. Therefore, individuals should inform the RSO before receiving medical treatments involving radionuclides.

After being informed of a medical intake, documentation should be obtained, signed by the individual stating the date of treatment, radionuclide used, amount of intake, and medical procedure. An assessment should be performed to determine what work restrictions may be necessary until the medical radionuclides have cleared to avoid problems with frisking/portal monitors, exposures to co-workers, or exposure to external dosimeters.

Individuals should be reassigned to areas outside the Restricted Area until the administered radionuclide is eliminated from the body to the extent that it will not significantly affect dosimeter measurements or expose members of the work force. The RSO will determine when the individual may re-enter the Restricted Area.

L. Lost or Damaged Dosimetry

Dose assessments shall be performed by the RSO for any lost or damaged dosimetry. The dose assessment shall be reviewed and approved by the RSO prior to assigning a dose. The individual of concern should sign the dose assessment verifying that the

information provided by the individual is accurate (a signature is not required if the individual did not provide any information). The results of the dose assessment shall be entered into the dosimetry record system and a copy of the assessment placed in the individual's exposure history file. Dose assessments shall include any contribution from airborne radioactivity.

Dose assessments may include the following as applicable:

1. Results of dosimeters worn by other individuals working in the same work area under similar exposure conditions during the same exposure period.

2. Calculations based on measured dose rates and the estimated time spent in the work area by the individual involved.

3. Results of other dosimeters worn by the individual during the same exposure period such as secondary dosimeters.

4. Assigning the worker the highest dose any single whole body part receives within the reporting period if multiple whole body dosimetry was used.

M. Doses Exceeding Annual Dose Limits

The RSO shall initiate an investigation to determine the cause for all instances where the Trace Analytical administrative dose limits were exceeded without prior authorization. A copy of the investigation report shall be placed in the individual's exposure record.

An investigation shall be initiated immediately if it is suspected or recognized that an individual has exceeded the NRC annual regulatory limits. The objective of the initial investigation shall be to establish the sequence of events resulting in the exposure and the level of dose received. The individual of concern shall not be allowed to enter a Restricted Area until the investigation has been completed.

According to the requirements of 10 CFR Part 20.2202 and 20.2203, notification to the NRC will be made under the following circumstances:

1. Immediate Notification

Circumstances in which an individual received or may have received a total effective dose equivalent of 25 rem or more, and eye dose equivalent of 75 rem or more, or a shallow dose equivalent to the skin or extremities of 250 rad or more, or a release of radioactive material such that an individual could have received an intake of five ALI in 24 hours.

2. 24- Hour Notification

Circumstances in which an individual received or may have received in a period of 24 hours a total effective dose equivalent exceeding five rem, and eye dose equivalent exceeding 15 rem, or a shallow dose equivalent to the skin or extremities exceeding 50 rem, or a release of radioactive material such that an individual could have received an intake exceeding one ALI.

3. 30- Day Written Notification

Circumstances in which and individual exceeds any regulatory dose limit.

Immediate and 24 hour notifications shall be confirmed by a written letter, facsimile, or telegram to the NRC or by e-mail. Trace Analytical shall prepare each report so that the names of individuals who have received exposure to sources of radiation are stated in a separate and detachable portion of the report.

30-day written notification reports shall describe the extent of exposure of individuals to radiation and radioactive material, including, as appropriate:

a. Estimates of each individual's dose;
b. The levels of radiation and concentrations of radioactive material involved;
c. The cause of the elevated exposures, dose rates, or concentrations; and
d. Corrective steps taken or planned to ensure against a recurrence, including the schedule for achieving conformance with applicable limits, ALARA constraints, generally applicable environmental standards, and associated license conditions.

Each 30-day written notification report filed with the NRC shall include for each occupationally overexposed individual the name, social security number, and date of birth. With respect to the limit for the embryo/fetus, the identifiers should be those of the declared pregnant woman. The report shall be prepared so that this information is stated in a separate and detachable portion of the report.

N. Radiation Exposure Reports

Annual exposure reports are not required to be submitted to the NRC. However, an annual preparation of Form NRC-5 "Occupational Exposure Record for a Monitoring Period" is required. Clear and legible equivalent documentation containing all the information required by Form NRC-5 may be utilized by Trace Analytical in lieu of the actual NRC-5 Form itself. Completed NRC-5 Forms, or equivalent, shall be available for review by regulatory personnel by April 1 of the following year.

An annual report of the individual radiation dose received for Trace Analytical projects shall be sent to each worker who was issued primary dosimetry during a calendar year by April 1 of the following year.

When requested by an individual, a written exposure report shall be provided to each such individual within 30 days of the request or within 30 days of exposure determination, whichever is later.

Trace Analytical shall supply a written exposure report upon request of a radiation worker who is terminating employment in a given calendar quarter. A written estimate of the worker's dose may be provided if the dosimetry monitoring results are not available at that time. Estimated doses shall be clearly indicated as such.

O. Radiation Exposure Report Record Keeping

Records of individual monitoring shall be kept in accordance with the instructions on Form NRC-5, or on clear and legible records containing all the information required by Form NRC-5. These records shall be updated at least annually.

Radiation exposure records shall use the units of the curie, rem, rad, or multiples thereof and shall clearly and specifically indicate the quantities (e.g., deep dose equivalent) and units , e.g., rem or mrem of all recorded values.

Records of embryo/fetus dose and the declaration of pregnancy shall be maintained with those of the mother.

Trace Analytical shall retain each dose form or record until license termination. Upon termination of the Trace Analytical license, Trace Analytical shall permanently store dose records on Form NRC-4 or equivalent.

X. HEALTH PHYSICS OPERATIONAL PROCEDURES

A. Survey Instrumentation

Radiation surveys shall be performed using a Ludlum Model 3 survey meter with a 44-2 scintillation probe or similar instrument. The survey instrument shall be capable of reading from 0 μR/hr through 5,000 μR/hr.

Contamination surveys shall be performed using a Ludlum Model 3 survey meter with a 44-9 Geiger-Mueller "pancake" type probe or similar instrument. The survey instrument shall be capable of reading from 0 cpm through 500,000 cpm. Using a manufacturer's efficiency for the Ludlum Model 3 of 30% for alpha particles, 220 dpm corresponds to 70 cpm above background. This will be easily determined if the background at the counting location is maintained at less than 50 cpm. Therefore, counting smears for alpha contamination shall be accomplished in areas where background is less than 50 cpm. Contamination survey instruments used for leak tests shall be capable of accurately measuring 220 dpm alpha activity.

All survey instruments shall be calibrated no less than annually by an agency or institution approved or recognized by the NRC to perform such calibration. All survey instruments shall be checked daily for proper battery response and proper response to a check source when radiation or contamination surveys are to be performed.

A low-volume air sampler, F&J Specialty Products, Inc. Model LV-1 or equivalent, equipped with a two-inch filter holder and having a volumetric flow rate of at least two cubic feet per minute shall be used to sample airborne particulates in the work area. The air sampler will be calibrated before each use using a bubble flow meter or other suitable calibration device.

Appropriate, operable and calibrated survey instruments shall be readily accessible to laboratory personnel. (10CFR20.1501.b.)

B. Instrument Pre-operational Checks

Pre-operational checks shall be performed on all survey instruments used at the beginning of each day's activities and any time an employee believes an instrument may not be operating correctly.

Pre-operational checks consist of a physical integrity check, calibration, battery and response check. Pre-operational checks shall be performed as follows.

1. Physical Check: Inspect the instrument to ensure the instrument is physically sound. Items to verify include:

a. Frayed, torn cables
b. Corroded or stuck connectors

c. Cracked meter faces
d. Bent or loose deflection needles
e. Loose or misaligned selector switch
f. Cracked casing
g. Torn Mylar of detector face

2. **Calibration Check:** Verify that the meter is within calibration limits by checking the calibration sticker attached to the instrument's housing. Ensure the instrument is calibrated in accordance with state requirements. The NRC requires exposure rate and count rate survey meters to be calibrated every 12 months and after each instrument servicing other than battery replacement.

3. **Battery Check:** Turn the selector switch on the instrument to the **BAT** position for a minimum of five seconds and verify on the meter face that the battery is functional. The meter needle should measure within the **BAT TEST** region. Batteries should be replaced if the needle does not deflect to above the lower **BAT TEST** line or if the needle is not stable.

4. **Response Check:** Perform a response check prior to use as follows:

Ludlum Model 3 with 44-2 probe or equivalent:

Place a check source with a known value against the end face of the probe. Turn the scale selector switch to an appropriate scale so that the indicating needle does not peg high or low, and so that a comprehensive instrument reading can be obtained. Note the meter reading in microRoentgen per hour (μR/hr). Values for the response check must be within 20% of a known value for the particular meter and source being used.

Known values for a specific instrument shall be determined as soon as possible after meter calibration. A response source shall be held against the end face of the probe and the meter reading noted. This reading shall be used to determine the ± 20% range. The same response source shall then be used for all future response checks.

Ludlum Model 3 with 44-9 "pancake" probe or equivalent:

Place a check source with a known value within 2"of the mylar window of the probe. Turn the scale selector switch to an appropriate scale so that the indicating needle does not peg high or low, and so that a comprehensive instrument reading can be obtained. Note the meter reading in counts per minute (cpm). Values for the response check must be within 20% of a known value for the particular meter and source being used.

Known values for a specific instrument shall be determined as soon as possible after meter calibration. A response source shall be held against the end face of the probe and the meter reading noted. This reading shall be used to determine the ± 20% range. The same response source shall then be used for all future response checks.

C. Survey Frequency

Radiation and contamination surveys shall be conducted daily in those areas in which radioactive material was handled. Weekly radiation and contamination surveys shall be performed within the Controlled Area. Monthly radiation and contamination surveys shall be performed of the entire Trace Analytical facility.

The applicable portions of the "Spill Contingency Plan" contained in Section 12.1 of this support procedure shall immediately be implemented if contamination is discovered greater than 1,000 dpm/100cm^2. The source of the contamination shall be identified, a determination shall be made to determine which samples (if any) may have been impacted by the contamination, and measures shall be implemented to prevent a recurrence.

D Radiation Surveys

1. Ensure the instruments pre-operational checks have been satisfactorily completed. Pre-operational checks include a physical integrity, battery, response, and calibration check. Pre-operational checks are described in Section 10.2 of this Plan.
2. Set the **AUD** (audible) switch to the **ON** position. The audible response is immediate whereas the meter indicating needle deflection achieves 90% of full range in 4 seconds and 22 seconds for fast and slow response, respectively.
3. Set the response mode switch to **F** for fast.
4. Switch the meter to the **X 1** scale.
5. Obtain a background dose rate by measuring radiation exposure levels at waist height, a sufficient distance from the equipment or survey object, so that they do not contribute to the measured radiation levels.
6 Obtain general area exposure rates by holding the probe at waist height.
7. Obtain equipment and material exposure rates by holding the probe within 1 cm of the item or area being surveyed. The probe should be moved at a rate of two to three inches per second.
8. Upon detecting elevated readings, switch the instrument to **S** mode for slow response.
9. Allow the meter needle to stabilize. If the needle goes off scale on the **X 1** scale then switch the meter to the **X 10** scale. Use higher scales as necessary.

E. Contamination Surveys

1. Removable Contamination

The following procedure shall be used when performing removable contamination surveys using the Ludlum Model 3 survey instrument with a Ludlum 44-9 Geiger-Mueller "pancake" type probe, or equivalent instrumentation:

a. Using moderate pressure, a wipe shall be smeared over an area of 100 cm^2 (16 in^2) on the item or area of concern. To obtain an area of 16 in^2 the wipe may be smeared over an area four inches by four inches or an area one inch wide by 16 inches long. Paper or cloth material may be used for wipes.

b. Using a Ludlum Model 3 with a 44-9 Geiger Mueller "pancake" probe, or equivalent, count the wipe as outlined below.

c. Ensure the instruments pre-operational checks have been satisfactorily completed. Pre-operational checks include a physical integrity, battery, response and calibration check. Pre-operational checks are described in Section 10.2 of this Plan.

d. Set the **AUD** toggle switch to **ON**. The audible response is immediate with the Ludlum Model 3 survey meter. Meter response as shown by the indicating needle is delayed and slower.

e. Set the response mode switch to **S** for slow.

f. Turn the meter on and obtain a background count rate. Ensure the background count rate is 50 cpm or less. Move the instrument to an area of lower background if necessary.

g. Hold the wipe within one centimeter of the counting surface of the instrument's probe for a minimum of five seconds. If an increase in count rate is noted, the wipe should be held under the probe until the meter reading stabilizes. Wipes with a sustained reading greater than or equal to 1,000 dpm/100cm^2 beta/gamma activity or 220 dpm/100cm^2 alpha activity are positive indication of loose surface contamination.

The manufacturer's efficiency for the Ludlum Model 3 with a 44-9 Geiger-Mueller "pancake" type probe is 30% for alpha particles, 10% for beta particles and 0.1% for gamma rays. Instrument readings in Counts per Minute (cpm) shall be converted to Decays per Minute (dpm) using the following equation when necessary:

$$DPM = \frac{CPM}{\%\ Detector\ Efficiency}$$

2. Fixed Contamination

The following procedure shall be used when performing fixed contamination surveys using the Ludlum Model 3 survey instrument with a Ludlum 44-9 Geiger-Mueller "pancake" type probe, or equivalent instrumentation:

a. Fixed contamination surveys shall be performed using a Ludlum Model 3 with a 44-9 Geiger-Mueller "pancake" probe, or equivalent instrumentation.

b. Ensure the instrument's pre-operational checks have been satisfactorily completed. Pre-operational checks include a physical integrity, battery, response and calibration check. Pre-operational checks are described in Section 10.2 of this Plan.

c. Set the **AUD** toggle switch to **ON**. The audible response is immediate with the Ludlum Model 3 survey meter. Meter response as shown by the indicating needle is delayed and slower.

d. Set the response mode switch to **S** for slow.

e. Turn the meter on and obtain a background count rate.

f. Hold the probe within one centimeter of the item's surface. Move the probe at a rate not to exceed two to three inches per second. If increased contamination levels are indicated either by the meter's indicating needle or audible response, slow the movement of the probe down and obtain a maximum count rate reading.

The manufacturer's efficiency for the Ludlum Model 3 with a 44-9 Geiger Mueller "pancake" type probe is 30% for alpha particles, 10% for beta particles and 0.1% for gamma rays. Instrument readings in Counts per Minute (cpm) shall be converted to Decays per Minute (dpm) using the following equation when necessary:

$$DPM = \frac{CPM}{\%\ Detector\ Efficiency}$$

F. Personnel Contamination Surveys

The following procedure shall be used when performing personnel contamination surveys using the Ludlum Model 3 survey instrument with a Ludlum 44-9 Geiger-Mueller "pancake" type probe, or equivalent instrumentation:

1. Ensure the instrument's pre-operational checks have been satisfactorily completed. Pre-operational checks include a physical integrity, battery,

response and calibration check. Pre-operational checks are described in Section X., B. of this Plan.

2. Set the **AUD** toggle switch to **ON**. The audible response is immediate with the Ludlum Model 3 survey meter. Meter response as shown by the indicating needle is delayed and slower
3. Set the response mode switch to **S** for Slow.
4. Turn the meter on and obtain a background count rate. Ensure the background count rate is 50 cpm or less. Move the instrument to an area of lower background if necessary.
5. The probe shall be held within one centimeter of the body and moved at a rate of two to three inches per second. Probe contact with the body should be avoided to the maximum extent possible. Monitoring shall start with the hands. Special attention should be given to the hair, face, hands, feet, knees and chest.
6. When monitoring, special attention shall be paid to the audible response. An increase in audible clicks indicates an increase in activity and the probe movement rate should be slowed down. A measurement of 100 CPM greater than background indicates that contamination is present.

G. Personnel Decontamination

Personnel found to be contaminated on their skin shall be decontaminated by washing the affected area using soap and tepid (room temperature) water. A gentle washing action, with vigorous rinsing and a high lather soap shall be used. Waterless washing gels may also be used. Other methods of personnel decontamination may be utilized per the Radiation Safety Officer's direction. Upon completion of the washing evolution, the affected area shall be resurveyed for contamination. Areas found to be contaminated after the initial wash shall be re-washed and surveyed until free of contamination. Care shall be taken not to irritate or abrade the skin. Only injured personnel requiring immediate medical attention shall be allowed to leave a Controlled or Restricted Area contaminated.

H. Airborne Radioactive Material Monitoring

Airborne releases of radioactivity to the environment shall be monitored, evaluated, and controlled (10CFR20.1301.a.1, 1501.a, 1701, EPA NESHAPS.) The Radiation Safety Officer shall determine which evolutions require airborne sampling and the frequency of airborne sampling. Generally speaking, materials that are wet, damp or moist do not readily become airborne and will not require airborne sampling. The preparation and handling of sample material for laboratory analysis also does not generally require airborne sampling. However, the Radiation Safety Officer shall give airborne sampling consideration to evolutions involving very dry or fuming materials, based upon type of evolution performed with the material, expected or known activity concentrations, or historical data.

Air sampling for radioactive materials will be accomplished using a F&J Specialty Products, Inc. Model LV-1 air sampler or similar air sampling device. The Model

LV-1 air sampler is a low-volume, 110 volt electrically driven, portable air sampler. The air sampler contains a calibrated flow gage capable of reading from 0 to 4 cfm (113 lpm) and is equipped with a filter holder capable of handling filters up to 47 mm in diameter. A non-collapsible Tygon® hose is capable of being fitted between the air sampler and the filter holder. This allows the filter holder to be placed in the immediate vicinity of concern, i.e. "the breathing zone" of an individual, while the air sampler itself remains outside the contaminated area. Tygon® hose length is not to exceed 50 feet.

A cellulose paper or glass fiber type filter, 47 mm in diameter, shall be used when sampling for airborne radionuclides. Similar paper filters may be used as long as they are capable of collecting and retaining airborne particulate radioactive materials.

Air samplers will initially be calibrated for flow rate by the manufacturer. Air samplers shall be calibrated annually thereafter. Calibration will be performed by the manufacturer or other approved vendor. Records of calibration shall be maintained for a minimum of three years.

Air Sampling Procedure

For the LV-1 air sampler, place a cellulose or glass fiber filter paper in the filter holder such that the rough side of the filter paper will be exposed to the airborne particulate radioactive materials. Attach the filter holder either directly to the air sampler itself or to a Tygon® hose attached to the air sampler. Place the filter holder assembly in the area to be monitored. Start the air sampler. Adjust the flow rate of the air sampler to 2 cfm (60 lpm). This is accomplished by looking at the calibrated flow gage on the air sampler and adjusting the flow rate adjusting knob until the flow gage reads 2 cfm (60 lpm). Note and record the start time of the air sampler and the flow rate of the air sampler. The LV-1 air sampler should be run until a minimum volume of 10^6 ml of air has passed through the filter paper. To achieve this minimum volume, the air sampler should be run at 2 cfm for 20 minutes, or 4 cfm for 10 minutes. Higher flow rates with lower run times are allowed. Longer run times resulting in larger volumes are also allowed. Note and record the time and the flow rate at the completion of the air sampling.

Carefully, using tweezers if possible, remove the filter paper from the filter holder. Place the filter paper in an envelope or other suitable container. The operator needs to exercise extreme caution when handling the filter paper to ensure that the filter paper does not become cross-contaminated during the handling process.

The following information shall be recorded on the container holding the filter paper.

- start and stop time of the air sampling operation.
- the date the air sample was taken.
- the air flow rate.
- the location where the air sample was taken.

- The printed name or initials of the person performing the air sampling operation.
-

I. Airborne Releases of Radioactivity to the Environment

Airborne releases of radioactivity to the environment shall be monitored, evaluated, and controlled. (10CFR20.1301.a.1, 1501.a, 1701, EPA NESHAPS). The Radiation Safety Officer shall determine which evolutions may release airborne contaminates to the environment frequency of environmental airborne sampling. When possible, the air sample should be taken when evolutions are taking place within the Restricted Area, which have the potential releasing airborne radioactive materials to the environment.

Wind direction, if applicable, shall be established prior to taking the air sample. The air sampling evolution shall occur on the down wind side of the Restricted Area boundary. The direction of the wind and the air sampling location shall be recorded. Significant changes in wind direction (greater than 90 degrees) during the air sampling evolution shall also be recorded, and the location of the air monitoring device shall be changed accordingly.

Air samples shall be sent to American Radiation Services or other NELAP accredited laboratory for analysis. The analysis should have an associated Lower Limit of Detection (LLD) that is one tenth of the effluent concentration value for the radionuclide being analyzed. For example, the effluent concentration value for cesium-137 in air is 2×10^{-10} µCi/ml, and the LLD of the analysis should, as a minimum, be 2×10^{-11} µCi/ml.

Air samples may be analyzed for the radionuclide of concern or they may be analyzed for gross alpha and gross beta activity, as directed by the RSO. The "Effluent Concentration" values listed in 10CFR20, Appendix B, Table 2, Column 1 shall be used for calculation purposes. The effluent concentration values for gross alpha and gross beta activity are listed in the table below.

Radionuclide	Effluent Concentration Value (µCi/ml)
Gross Alpha	1×10^{-15}
Gross Beta	1×10^{-12}

The highest gross alpha and gross beta airborne concentration measured should be used for internal dose calculation purposes. For calculation purposes, it will be assumed that a member of the general public will be continually present (24 hours a day) at the location where the highest airborne activity was measured.

The following equation may be used when calculating the internal dose to a member of the public due to gross alpha activity:

$$\frac{\left(\begin{array}{c}Gross\ alpha\\ activity\ of\ air\\ sample\ in\ \mu Ci/ml\end{array}\right)x\left(\begin{array}{c}Number\ of\ hours\\ Restricted\ Area\\ was\ established\end{array}\right)x(50\ mrem/year)}{(1x10^{-15}\ \mu Ci/ml)x(8{,}760\ hours/year)} = Gross\ alpha\ dose\ in\ mrem$$

The following equation may be used when calculating the internal dose to a member of the public due to gross beta activity:

$$\frac{\left(\begin{array}{c}Gross\ beta\\ activity\ of\ air\\ sample\ in\ \mu Ci/ml\end{array}\right)x\left(\begin{array}{c}Number\ of\ hours\\ Restricted\ Area\\ was\ established\end{array}\right)x(50\ mrem/year)}{(1x10^{-12}\ \mu Ci/ml)x(8{,}760\ hours/year)} = Gross\ beta\ dose\ in\ mrem$$

J. Environmental Liquid Monitoring

It is the intent of Trace Analytical not to discharge radioactive material in liquid effluents to unrestricted areas greater than the effluent concentration values listed in 10 CFR 20. The following actions shall be performed in the unlikely event that it is decided that liquids will be discharged to the environment.

1. A sample of the liquid shall be obtained and analyzed prior to discharge to the environment.
2. The sample shall be sent to American Radiation Services or other NELAP laboratory for analysis of the radionuclide(s) of concern. The analysis should have an associated Lower Limit of Detection (LLD) that is one tenth of the effluent concentration value for the radionuclide being analyzed. For example, the effluent concentration value for cesium-137 in water is 1 x 10^{-6} µCi/ml, and the LLD of the analysis should, as a minimum, be 1 x 10^{-7} µCi/ml.

Liquids containing radioisotopes greater than the applicable effluent concentration values listed in 10 CFR 20 shall not be discharged to unrestricted areas. However, they may be discharged to sanitary sewage systems under the provisions contained in 10CFR20.2003. Effluents released to the sanitary sewer shall meet the four provisions of 10CFR20.2003 (i.e., readily soluble, quantity released into sewer does not exceed concentration listed in appendix B, Part 20, determination of fractional limits and sum of those fractions for each radionuclide.)

XI. RECEIPT, STORAGE, AND DISPOSAL OF SOURCES AND SAMPLES CONTAINING RADIOACTIVE MATERIAL

A. Radioactive Samples

Trace Analytical defines a "radioactive sample" as:

1. Any sample with activity concentrations greater than the "Exemption Concentration" limits specified in 10CFR30.70, Schedule A; or

2. Any sample containing a quantity of activity greater than the "Exempt Quantity" limits specified in 10CFR30.70, Schedule B.

Samples with unknown activity levels will be treated as "radioactive" when the sample material exhibits radiation levels greater than background.

Waste material containing licensable quantities of radioactive material shall be disposed of in accordance with Section 11.7 of this Laboratory Radiation Safety Plan.

B. Receipt of Sources and Samples

Analytical check sources and samples received by Trace Analytical which require monitoring in accordance with 10CFR20.1906, shall be surveyed for both radiation and removable contamination levels upon receipt. The monitoring shall be performed as soon as practicable after receipt, but no later than three hours after the package has been received under normal working hours, or not later than three hours after the beginning of the next working day if the package is received after working hours (10CFR20.1906) requires radiation and contamination surveys of any package containing quantities of radioactive material in excess of a Type A quantity and of any package labeled with a White-1, Yellow-II, or Yellow-III label as specified by the U.S. Department of Transportation in Title 49 of the Code of Federal Regulations.

A wipe survey of the external surfaces of the source or sample container shall be performed when performing the initial monitoring of sources and samples. Any source or sample container with external smearable activity levels greater than 1,000 disintegrations per minute per 100 cm^2 beta/gamma activity or 220 disintegrations per minute per 100 cm^2 alpha activity greater than background shall be considered as having loose surface contamination and the sender notified.

Trace Analytical shall monitor all packages known or suspected to contain radioactive material for removable contamination and radiation levels upon receipt. Samples or analytical check sources received which were transported inside storage containers, (plastic Trace Analytical bottles, zip-lock bags, Marinelli beakers, etc.) in which the containers have become physically damaged shall be promptly placed in a non-damaged container and appropriate contamination surveys performed.

At sample receiving, samples from potentially radioactive sites shall be screened to ensure that customer identification of radioactivity (or lack of radioactivity) is correct, and shall ensure that the sample is properly categorized (per their definition of radioactivity) for sample handling in the laboratory, and, in the absence of customer supplied information, obtain data input for the radioactive materials license tracking system.

C. Storage of Licensed Material, Analytical Check Sources, and Samples

All samples sent to the laboratory for analysis and all licensed material possessed by Trace Analytical will be stored in a designated storage location which is secure from unauthorized access or removal (10CFR20.1801, 1802.) The storage location shall, as a minimum, be posted "Caution: Radioactive Materials." Postings shall be in accordance with 10CFR20.1901. The background color of the posting shall be yellow, contain magenta, purple or black wording, and bear the conventional radiation tri-foil symbol.

Prior to opening a box or container holding samples that have been shipped to Trace Analytical, an exposure rate and removable contamination survey shall be conducted of the external surfaces of the box or container (10CFR20.1501.a.) Upon opening the shipping container, a removable contamination survey and visual inspection shall be conducted of all sample containers, looking for sample container breakage, leakage, or integrity damage. Radioactive material received which was not shipped in accordance with the Code of Federal Regulations, Title 49, Parts 170 through 178, and/or with the presence of external removable contamination greater than twice background levels on shipping or sample containers, shall be brought to the immediate attention of the Laboratory Supervisor. The Radiation Safety Officer or Sample Receiving Supervisor will determine if it is necessary to notify the shipper of the occurrence and ensure that any removable contamination that has spread to work spaces has been removed.

The sample's gamma exposure rates and suspected radioactivity levels should be checked against any accompanying documentation for consistency and to ensure that Trace Analytical Radioactive Material License radioisotope quantity limits are not exceeded.

All samples received by the Trace Analytical laboratory shall be assumed to contain radioactive material and shall be handled and treated as such until analysis proves otherwise. Sample containers which are known or suspected of containing radioisotopes in concentrations greater than those specified in 10CFR20, Appendix C, shall be labeled or otherwise marked with the word "Radioactive."

Sample and shipping containers known or suspected of containing fine, dry particulate matter or fuming materials should be opened in a fume hood. Additionally, all sample and shipping containers with gamma exposure rates greater than 5,000 μR/hr shall be opened in a fume hood. Samples with gamma exposure rates greater than 5,000 μR/hr shall be segregated from those samples with lesser gamma exposure rates.

Trace's Radiation Safety Officer and/or Quality Assurance Officer shall be notified when a sample is received by Trace, and it is apparent or suspected that sample integrity has been violated. Trace Analytical shall notify the client and either request another sample or, if the client insists upon analysis of the sample, include a

disclaimer in the final report identifying the sample anomaly. The disclaimer shall be permanently attached to the final report.

D. Inventory of Radioactive Analytical Standards, Tracers and Samples

A written inventory of all analytical standards used by the laboratory shall be maintained. An analytical source standard inventory shall be performed semi-annually.

A written inventory of all samples received by the laboratory for analysis shall be maintained. As a minimum this inventory will show the arrival date of the samples, the origin of the samples, and the date the samples were returned to the client or disposed.

Records of analytical source standards, and samples received shall be maintained by Trace Analytical for a minimum of three years.

E. Return of Samples

All sample material received by Trace Analytical containing licensable quantities of radioactive material shall be returned to client submitting the sample as soon as practicable, or shall be shipped to a licensed disposal facility. Sample material containing licensable quantities of radioactive material, which is to be shipped to a disposal facility, shall be stored in closed containers. The total volume of sample material awaiting shipment to a disposal facility shall not exceed four (4) 55-gallon drums.

The requirements of 10CFR20, Appendix F, III Requirements, shall be followed, when applicable, when sample material cannot be returned to a client and must be disposed.

F. Packaging of Low Level Radioactive Waste for Disposal

1. Packaging of low-level radioactive waste for disposal shall be in accordance with 10CFR20.2006.d. The following are minimum requirements for all classes of low-level radioactive waste and are intended to facilitate handling and provide protection of health and safety of personnel at a disposal site:

    a. Wastes shall not be packaged for disposal in cardboard or fiberboard boxes.

    b. Liquid waste shall be packaged in sufficient absorbent material to absorb twice the volume of the liquid.

c. Solid waste containing liquid shall contain as little free-standing and non-corrosive liquid as is reasonably achievable, but in no case shall the liquid exceed one percent of the volume.

d. Waste shall not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reactions with water.

e. Waste shall not contain, or be capable of generating, quantities of disposing of the waste. This does not apply to radioactive gaseous waste packaged in accordance with Subsection "F, 1f" below.

f. Waste must not be pyrophoric. Pyrophoric materials contained in wastes shall be treated, prepared, and packaged to nonflammable.

g. Waste in a gaseous form shall be packaged at an absolute pressure that does not exceed 1.5 atmospheres at 20°C. Total activity shall not exceed 3.7 TBq (100 Ci) per container.

h. Wastes containing hazardous, biological, pathogenic, or infectious material shall be treated to reduce to the maximum extent practicable the potential hazard from the non-radiological materials.

2. Stability is intended to ensure that the waste does not degrade and affect overall stability of the disposal site through slumping, collapse, or other failure of the disposal unit and thereby lead to water infiltration. Stability is also a factor in limiting exposure to an inadvertent intruder, since it provides a recognizable and non-dispersible waste. The following requirements shall be followed by Trace Analytical to provide stability of the waste at the disposal site:

a. Waste shall have structural stability. A structurally stable waste form will generally maintain its physical dimensions and its form under the expected disposal conditions such as weight of overburden and compaction equipment, the presence of moisture, microbial activity and internal factors such as radiation effects and chemical changes. Structural stability can be provided by the waste form itself, processing the waste to a stable form, or placing the waste in a disposal container or structure that provides stability after disposal.

b. Wastes containing liquid shall be converted into a form that contains as little freestanding and non-corrosive liquid as is reasonably achievable, but in no case shall the liquid exceed one percent of the volume of the waste when the waste is in a disposal container designed to ensure stability, or 0.5 percent of the volume of the waste for waste processed to a stable form.

c. Void spaces within the waste and between the waste and its package shall be reduced to the extent practicable.

d. Each container of low-level radioactive waste shall be clearly labeled to identify whether it is Class A, Class B, or Class C waste, in accordance with 10CFR20, Appendix D.

G. Disposal of Generated Waste Containing Radioactive Material

Waste generated during sample preparation, analysis and cleanup operations containing licensable quantities of radioactive material shall be returned to client submitting the sample as soon as practicable, or shall be shipped to a licensed disposal facility. Waste material containing licensable quantities of radioactive material, which is to be shipped to a disposal facility, shall be stored in closed containers. The total volume of waste material awaiting shipment to a disposal facility shall not exceed 220 gallons. Waste shall only be shipped to a licensed disposal facility (10CFR30.41, 10CFR20.2001.b.)

The requirements of 10CFR20, Appendix F, III Requirements, shall be followed, when applicable, when solid waste material cannot be returned to a client and must be disposed.

Disposed sample container "radioactive" labels shall be removed or defaced (10CFR20.1904.b.)

Liquid waste generated shall be stored in closed containers. A sample of all liquid waste to be disposed of shall be taken before disposal and analyzed for radioactive contents and activity. Disposal of liquid waste will be by release into sanitary sewage systems in accordance with 10CFR20.2003. Records of all waste disposed of shall be maintained in accordance with 10CFR20.2108 until termination of the Trace Analytical license.

Radioactive and mixed wastes awaiting disposal shall be segregated from non-radioactive process wastes.

XII. EMERGENCY OPERATING PROCEDURES

A. Spill Contingency Plan

This spill contingency plan consists of procedures to follow in the event of a spill of radioactive material or a spread of radioactive contamination. The identification of radioactive loose contamination during routine contamination surveys outside of controlled areas constitutes a spill for the purpose of this Spill Contingency Plan. The purpose of this plan is to provide coordinated response to spills, accidental discharges or uncontrolled spreads of radioactive material. It is the responsibility of the

Radiation Safety Officer to ensure that all workers are familiar with this plan. The Radiation Safety Officer shall be responsible for ensuring that the spill is stopped and for any subsequent clean-up and decontamination efforts.

Basic Spill Procedure

The spill contingency plan will follow the basic "S.W.I.M.S." procedures as outlined below. All the steps in the procedure shall be carried out concurrently with each other.

1. Stop the spill. The primary effort of personnel upon noticing a spill will be to stop the spill. This may be accomplished by such simple operations as up-righting an over turned sample bottle, shutting a valve, stopping a pump, or tightening a flange or gasket.

2. Warn others. It will be the responsibility of the person noticing a spill to warn other workers in the vicinity of the spill of the danger and to ensure that the Radiation Safety Officer is notified of the occurrence as soon as possible.

3. Isolate the area. It will be the responsibility of the persons combating the spill to contain the spill and isolate the area of occurrence to prevent possible inadvertent personnel contamination.

4. Minimize spill spread and personnel exposure. Every effort shall be made by the personnel combating the spill to contain the spill to as small an area as possible. Additionally, it will be the responsibility of all personnel combating the spill to minimize their exposure. Exposure to radioactive contaminants can be prevented by the wearing of appropriate protective clothing. Time spent in the spill area will be minimized to prevent unnecessary whole body gamma exposure.

5. Secure operations. All operations which could possibly result in the spread of the spill, or which could cause the spilled effluents to become airborne, shall be immediately stopped.

The source of the contamination shall be identified if not readily apparent, appropriate spill decontamination shall be performed to levels consistent with those contained in Section 8.9.1 of these support procedures, a determination shall be made to determine which samples (if any) may have been impacted by the contamination, and measures shall be implemented to prevent a recurrence.

B. Contaminated Injured Man

In the event an individual becomes injured, prompt and appropriate attention shall be given to that person. All equipment or evolutions causing or complicating the injury shall be shutdown or stopped immediately; sample preparation activities ceased, pumps or motors secured, electrical equipment de-energized, ventilation secured, etc.

The Radiation Safety Officer shall be responsible for ensuring that medical assistance, i.e. ambulance and paramedic services, first responder assistance, etc., for all serious injuries requiring such assistance are requested. In the absence of the Radiation Safety Officer, a member of Trace Analytical Management shall make the request for medical assistance. Initial request shall be made by calling 911 on a phone.

In the event the injured person is contaminated with radioactive material, every effort shall be made to decontaminate the individual, except when the decontamination process may interfere with medical attention, treatment or removal of the injured. Medical attention shall not be delayed to decontaminate a seriously injured person.

In the event of a life threatening injury, medical personnel, paramedics, first responders, and other personnel immediately present at the scene shall not be delayed in their efforts to treat the injured person. They shall be allowed to immediately enter a Restricted or Controlled Area, without protective clothing, if necessary. However, these personnel shall be informed prior to entering the Restricted or Controlled Area that radioactive material is present. These personnel shall be monitored for contamination on their skin and clothing upon exit from the area, and shall be decontaminated as necessary, unless it will further interfere with the treatment of the injured person.

Contaminated individuals with life threatening injuries shall be allowed to be transported to a medical facility without decontamination. The person responsible for the transportation, i.e. the ambulance driver, paramedics, helicopter pilot, etc. shall be informed prior to leaving the scene that the injured person has or may have removable radioactive material present on their body or clothing. An individual trained in the use of a contamination survey instrument, and in the hazards associated with radiation and radioactive material, shall accompany or follow the injured individual. This person shall take a contamination survey instrument with him. The person who accompanies or follows an injured person to a medical facility shall survey the transportation vehicle, transportation personnel, applicable portions of the medical facility, and medical staff for contamination as soon as possible.

Contaminated vehicles and equipment shall be isolated from use until decontamination can take place. Personnel found to be contaminated shall be decontaminated at the earliest opportunity. The surveyor shall record and document all surveys made. It is the responsibility of Trace Analytical to control all contamination that may have spread outside a Controlled Area due to the emergency, and to decontaminate or dispose of all equipment, materials, vehicles and personnel that may have become contaminated.

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APPENDIX A

PROFESSIONAL RESUMES

1. Bruce Pelletier
2. Jon Mink

TRACE ANALYTICAL LABORATORIES, INC.

R. BRUCE PELLETIER, President

The Company President is responsible for the overall operation, planning, organizing, and directing of the laboratory and management staff. Key areas of responsibility are corporate image, client relations, company leadership, employee relations, quality assurance, and financial management. Bruce is also the Radiation Safety Officer for the Company.

RESPONSIBILITIES

- Assists with budget development, cash flow management, tax planning, financial strategies and organization of overall financial functions.
- Sets corporate goals and makes recommendations for plans to achieve these goals.
- Works with staff to develop and maintain a strong professional image for the company with respect to its clients, competitors, employees, and the community.
- Provides technical information and advice to clients regarding their projects or proposed projects.
- Oversees and assists with repairs, maintenance and installation of instrumentation. Also oversees facility maintenance.
- Coordinates changes within the laboratory to comply with changing regulatory requirements.
- Assists laboratory staff in writing, reviewing, and implementing SOP's.
- Serves as project coordinator for special or unusual analytical projects that differ from those commonly conducted by the laboratory.
- Reviews proposed projects containing requests for air analyses to determine if the work is within the capabilities of the laboratory.
- Supervises method development and method validation procedures for air quality analyses.
- Trains and qualifies chemists and technicians for the safe handling, analysis, storage and disposal of low-level radiation samples.

PROFESSIONAL EXPERIENCE

January 1981 to Present: Instructor for the Michigan Office of Firefighter Training.
Taught courses in basic firefighting techniques, Hazardous Materials Operations, Educational Methodology and Strategy and Tactics for Fire Department Company Officers.

January 1990 - Present: TRACE Analytical Laboratories, Inc., Muskegon, MI
President and Co-Owner
Air Quality Supervisor, and Special Projects Coordinator.

January 1984 - December 1990: Koch Chemical Company, Inc., Whitehall, MI
Senior Analytical Chemist and Quality Control Director
Supervised a staff of one chemist and three technicians. Responsible for the day to day operations of the FDA approved Product Testing Laboratory. Primary responsibilities included the analyses of incoming raw materials to validate stated purity, analyses of pharmaceutical intermediates to determine reaction completeness, and final product testing to formulate Certificates of Analysis for the final finished products. Additional responsibilities included instrument repair and maintenance, writing and implementation of SOP's. Instrumentation used and maintained for this position included gas chromatographs, high pressure liquid chromatographs, infrared spectrophotometers, visible and UV wavelength scanning spectrophotometers, automatic titrators, refractometers, melting point apparatus, fractional distillation equipment, and precision analytical balances.

May 1977 - December 1983: Aquatic Systems, Inc., Ludington, MI
Laboratory Director
Responsible for the daily operation of the environmental laboratory. Responsibilities included scheduling, instrument repair and maintenance; writing and implementation of SOP's, project management, data review, and the training of laboratory staff. This was a working position that also required the analysis of client samples for wet chemistry, metal, volatile and semi-volatile organic parameters. Instrumentation used and maintained under this position included gas chromatographs, high pressure liquid chromatographs, atomic absorption spectrophotometers, visible and UV wavelength spectrophotometers, infrared spectrophotometers, and precision analytical balances.

September 1975 - May 1977: Central Michigan University, Mt. Pleasant, MI,
University Instructor for the Biology Department
Responsible for teaching General Biology and Determinative Bacteriology classes under a graduate teaching assistantship. This position required the formulation and presentation of course lectures and laboratory sections. An additional requirement was the advanced preparation of bacteriological culture media and glassware.

October 1975 - May 1977: Three Lakes Association, Inc., Antrim County, MI,
Water Quality Specialist
Responsible to formulate and implement a comprehensive water sampling and analysis program to determine and document the water quality of Torch, Clam, and Bellaire Lakes of Antrim County. Tests conducted on these lakes included bottom dredging and identification of invertebrates, bottom coring for lake aging and sediment profiling, transparency measurements, total phosphorus, ammonia nitrogen, nitrate nitrogen, total organics, and chlorophyll analyses. Additional responsibilities included maintaining all sampling and analytical equipment and to provide written annual reports of all findings to the lake association.

EDUCATION

- **B.S., Aquatic Biology**, Michigan State University,
  Minor in Chemistry
- **M.S., Limnological Studies**, Central Michigan University,

PROFESSIONAL ORGANIZATIONS/CERTIFICATIONS

- American Chemical Society
- Society of American Military Engineers
- State of Michigan Certified Instructor - Handling Hazardous Materials & Hazardous Materials Operations
- Certified Advanced Hazardous Materials Technician
- Certified Nuclear Radiation Technician
- Certified Radiation Safety Officer

JON MINK, Technical Systems/Project Manager/Alternate Radiation Safety Officer

The Technical Systems/Project Manger is responsible for mobile analytical services, sampling services, equipment repair and maintenance, waste management and disposal, LIMS/computer systems management and special project management. The Alternate Radiation Safety Officer help fulfill all duties and responsibilities of the Radiation Safety Officer.

RESPONSIBILITIES

- Evaluate the ability of the laboratory to perform new methods with existing equipment and personnel.
- Determine project requirements with clients, as pertaining to instrumental and staff capabilities. As necessary develop and implement new analytical methodologies as required by client project needs.
- Set up and oversee laboratory equipment maintenance and preventative maintenance schedules.
- Conduct major repairs of analytical equipment with help from the manufacturers technical support staff. If necessary schedule on-site or off-site repair.
- Develop, implement, and oversee a plan for the management and disposal of laboratory and sample waste.
- Work with clients to determine sampling requirements.
- Manage LIMS/Computer systems.
- Building maintenance.

PROFESSIONAL EXPERIENCE

September 1995 – Present: TRACE Analytical Laboratories, Inc., Muskegon, MI, Technical Systems Manager/Project Manager

July 1993 – September 1995: TRACE Analytical Laboratories, Inc., Muskegon, MI, Project Manager

The Project Manager was responsible for the management of the mobile analytical services. Duties also included special project management. Included were the selection, set-up, and maintenance of instrumentation.

July 1992 - July 1993: TRACE Analytical Laboratories, Inc., Muskegon, MI, Application Specialist

Responsible for determining the laboratories abilities to meet specific, non-standard, client analytical requests. Also responsible for the implementation of new EPA analytical methods not currently being performed by the laboratory.

July 1991 - July 1992: TRACE Analytical Laboratories, Inc., Muskegon, MI, Client Services / Safety Manager

Corresponded with clients regarding analytical requirements. Included in this was the determination of proper sample techniques, volumes, containers, preservatives, and hold times. Also worked closely with the laboratory to determine the availability of analytical results and priority sample treatment. Other duties included ordering of supplies needed by the laboratory for day to day operations, and the development of the laboratory safety plan.

September 1990 - July 1991: TRACE Analytical Laboratories, Inc., Muskegon, MI, Analyst

Performed analyses in all areas of the laboratory. Set-up new equipment for analytical determinations, investigated and implemented new methodologies. Also responsible for field sampling.

January 1984 - September 1988: University of California at San Diego, School of Medicine Pathology Department. La Jolla, California,
Lab Assistant II

Worked with a principal investigator doing research on cholestasis and choleuresis as an electron microscopist and research assistant. Duties included small animal surgeries, tissue harvesting, tissue processing for light microscopy and transmission electron microscopy, electron micrograph development and printing, student assistant supervision, paper writing for journal publication, and laboratory purchasing. Also assisted with the laboratory program for the use and monitoring of radioactive compounds that were used for autoradiography. This required the successful completion of the University's Radioactive Handling Training and Certification program.

EDUCATION

- **B.A., Microbiology**, University of California, San Diego, Revelle campus
  minors in Physiological Psychology and Chemistry

PROFESSIONAL ORGANIZATIONS/CERTIFICATIONS

- Hazardous Materials Specialist
- Firefighter I & II
- Confined Space Rescue Technician
- Member Muskegon County Hazmat Team
- Member Michigan Regional Response Team for Western Michigan District

APPENDIX B

CERTIFICATES OF TRAINING

NFA Educational Methodology Course
Certificate for Fire Training Instructor
Certificate for Hazardous Materials Operations Instructor
Certificate for Advanced Hazardous Materials Technician
Certificate for Hazardous Materials Nuclear Radiation Technician
Certificate for NORM Radiation Safety Officer
Certificate for NORM Survey Course Completion
Certificate for Training in NORM Transportation
Documents from ARS Showing Topics of NORM Training

United States Fire Administration

National Fire Academy

RESIDENT PROGRAMS

This Certificate is awarded to

RALPH PELLETIER

for successful completion of

Education Methodology I - 80 hours

issued this

First

day of

February 1980

Administrator, U.S. Fire Administration

Superintendent, National Academy for Fire Prevention and Control

WILLIAM G. MILLIKEN
Governor

STATE OF MICHIGAN

FIRE FIGHTERS TRAINING COUNCIL

Hereby awards the certificate of

FIRE TRAINING INSTRUCTOR (B)

to

BRUCE PELLETIER

FOR HAVING SUCCESSFULLY QUALIFIED AS A
FIRE TRAINING INSTRUCTOR.

DATE OF AWARD APRIL 1, 1981.

Leon Krawiewski
CHAIRMAN

Phillip K. Alber
EXECUTIVE SECRETARY

Michigan State Police

Certification of Training

This is to certify that

R. BRUCE PELLETIER

has successfully completed a course in

AWARENESS/OPERATIONS TRAIN-THE-TRAINER

consisting of 7 *hours of instruction.*

December 5, 1997
Date

Robert C. Tarnow

Michigan State Police

Certification of Training

This is to certify that

R. Bruce Pelletier

has successfully completed a course in

Hazardous Materials Technician - Advanced

consisting of 40 *hours of instruction.*

04/17/2006 to 04/21/2006
Date

Kristie Etue

Office for Domestic Preparedness

To all who read this let it be known

R. Bruce Pelletier

HAS SUCCESSFULLY COMPLETED
THE DEPARTMENT OF JUSTICE
WEAPONS OF MASS DESTRUCTION

Radiological/Nuclear Course for Hazardous Materials Technicians

20 – 23 September 2004

Course # 19-04

At The National Center For Exercise Excellence, Nevada Test Site

CONDUCTED BY BECHTEL NEVADA COUNTER TERRORISM OPERATIONS SUPPORT

This course is approved for 3.2 hours of Continuing Education Credit by the University of Nevada, Las Vegas, Division of Continuing Education

NATIONAL SECURITY RESPONSE
PROGRAM MANAGER

COUNTER TERRORISM OPERATIONS
SUPPORT PROJECT MANAGER

NNSA National Nuclear Security Administration

UNLV

Bechtel Nevada

Certificate of Qualification

This is to certify that

Bruce Pelletier

has successfully completed an approved 40-hour training course as a

NORM Radiation Safety Officer

The course included a practical assessment and written examination

Certification Date: November 12-16, 2007

Location: Port Allen, Louisiana

Mark W. Krohn
Instructor
American Radiation Services, Inc.

ARS INTERNATIONAL

Certificate of Qualification

This is to certify that

Bruce Pelletier

has successfully completed a training course in

NORM Surveying and Control

The course included a practical survey assessment and a written examination

Certification Date: November 16, 2007

Location: Port Allen, Louisiana

Mark W. Krohn
Instructor
American Radiation Services, Inc.

ARS INTERNATIONAL

Certificate of Qualification

This is to certify that

Bruce Pelletier

has successfully completed a training course in

Transportation of Naturally Occurring Radioactive Material

The course met the training requirements of 49CFR172.700 through 172.704 and Chapter 15 of LAC 33:XV as they pertain to the radiation hazards associated with the transportation of NORM.

Certification Date: November 14, 2007

Location: Port Allen, Louisiana

Mark W. Krohn
Instructor
American Radiation Services, Inc.

ARS INTERNATIONAL

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

November 16, 2007

Louisiana Department of Environmental Quality
Office of Environmental Services
Permits Division, Radiation Protection Section
P.O. Box 4313
Baton Rouge, Louisiana 70821-4313

Dear Sir or Madam:

This letter is to certify that Mr. Bruce Pelletier has successfully completed a 40-hour training course as a "NORM Radiation Safety Officer". The course was held on November 12th through November 16th, 2007 in Baton Rouge, Louisiana. The course included instruction for NORM Surveyors as required by the Louisiana Administrative Code, Title 33, Part XV, Chapter 14, Appendix A, and for Radiation Workers as required by Chapter 10, Article 1012. The course also included, but was not limited to, the following:

- Fundamentals of Radiation
- Sources of Radiation (NORM)
- Biological Effects of Radiation
- Exposure Risk to the Unborn Child
- Radiation Protection Principles
- ALARA, Exposure Minimization
- Protective Clothing
- Emergency Actions
- Respiratory Protection Requirements
- Federal Regulations
- Louisiana Radiation Regulations
- State Notification Requirements
- Radiation Protection Programs
- Type of Survey Instruments
- Radiation and Contamination Survey Techniques
- Documentation Requirements
- Radiation Survey Instrument Calibration Requirements
- Radiological Sampling
- Analytical Methodologies and Equipment
- Personnel Monitoring
- Dose Assessment
- Waste Management Program
- Disposal Options
- Shipping and Manifesting
- Legal Responsibilities
- RSO Responsibilities
- Liability Minimization
- RSO Problems and Solutions
- Worker Rights, Notice to Workers
- Postings, Labeling
- Practical Survey Session
- Written Test

If you have any questions, or need assistance, please don't hesitate to call any of the ARS staff at 1-800-401-4277.

Sincerely,

Mark W. Krohn
American Radiation Services, Inc.

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

November 16, 2007

Louisiana Department of Environmental Quality
Office of Environmental Services
Emergency & Radiological Services Division
P.O. Box 4312
Baton Rouge, Louisiana 70821-4312

Dear Sir or Madam:

This letter is to certify that Mr. Bruce Pelletier has successfully completed a training course in "NORM Surveying and Control" held on November 16, 2007, in Port Allen, Louisiana. The course included instruction for NORM Surveyors as required by the Louisiana Administrative Code, Title 33, Part XV, Chapter 14, Appendix A, and for Radiation Workers as required by Chapter 10, Article 1012. This course also included, but was not limited to the following:

- Origin of NORM
- Sources of Radiation
- State Regulations
- Documentation Requirements
- Types of Radiation
- Radiation and Contamination Units
- Biological Effects
- Exposure Minimization
- Protective Clothing
- Radiation Survey Instrument Theory
- Radiation and Contamination Survey Techniques
- Radiation Survey Instrument Calibration Requirements
- Exposure to the Unborn Child
- Personnel Monitoring
- Emergency Actions
- Practical Survey Session
- Written Examination

If you have any questions, or need assistance, please don't hesitate to call any of the ARS staff at 1-800-401-4277.

Sincerely,

Mark W. Krohn
American Radiation Services, Inc.

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

November 14, 2007

U.S. Department of Transportation
400 Seventh Street SW
Washington, DC 20590

Dear Sir or Madam:

This letter is to certify that Mr. Bruce Pelletier has successfully completed a training course in the "Transportation of Naturally Occurring Radioactive Material." The course was held on November 14, 2007 in Port Allen, Louisiana. The course met the training requirements contained in 49CFR172.700 through 49CFR172.704 as they pertain to radiation hazards associated with the transportation of Naturally Occurring Radioactive Material. The course included, but was not limited to, the following:

- General awareness / familiarization training
- Function specific training
- Safety training
- Emergency response information requirements
- Measures to protect the employee from radioactive material in the work place including specific measures to protect employees from radiation exposures
- Methods and procedures for avoiding accidents
- Security awareness training
- Hazard communication training as it applies to the transportation of naturally occurring radioactive materials

If you have any questions, or need assistance, please don't hesitate to call any of the ARS staff at 1-800-401-4277.

Sincerely,

Mark W. Krohn
American Radiation Services, Inc.

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

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