1. **Purpose:** The following procedure describes how to perform meter and swipe surveys and when to document surveys.

2. **Scope:** Radiation Workers (RW), Authorized Users (AU), and Permitted Individuals (PIs) should use this procedure to develop permit-specific procedures for surveying their radiation spaces. When creating new procedures, refer to the Radiation Safety Manual (RSM) for acceptable dose rates and removable contamination levels.

3. **Definitions:**

   3.1 Annual Limit on Intake (ALI) – The amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. This amount would result in a committed effective dose equivalent of 5 rem or a committed dose equivalent of 50 rem to any organ or tissue.

   3.2 Fixed contamination – Undesirable radiological material that is attached to a surface and cannot be cleaned or decontaminated.

   3.3 Removable contamination – Undesirable radiological material that can be cleaned up or easily spread.

4. **Procedure Details:**

   4.1 Identification of fixed and removable contamination can be achieved by using appropriate instrumentation based on the radionuclides being used. Determination of appropriate instrumentation should be performed during the initial application. Table 1 lists common handheld and stationary detection equipment as well as the types of radiation detected and general efficiencies for each.

Table 1. Common Radiation Detectors and general detection abilities.

Detector	Radiation	Efficiency
GM	Alpha/Beta	Moderate
GM	Gamma	<1%
NaI Scintillator	Gamma/X-Ray	Moderate (depends on crystal thickness)
Plastic Scintillator (e.g. ZnS)	Alpha/Beta	Moderate (depends on window thickness)
Liquid Scintillation Counter (LSC)	Alpha/Beta	High
Liquid Scintillation Counter (LSC)	Gamma	Moderate
Gamma Counter/Well Counter (NaI)	Gamma/X-Ray	High
Gas Proportional	Alpha	High
Gas Proportional	Beta	Moderate
Gas Proportional	Gamma	<1%

4.2 Dose rate meter surveys should be performed at the end of each RAM use period and should include, at minimum, surveying the area where RAM was used as well as your hands and feet. These surveys should be performed in locations where workers are exposed to radiation levels that might result in radiation doses in excess of 10% of the occupational dose limits. Frequency of surveys depends on the quantity and use of RAM, as well as the specific facilities, equipment, and procedures designed to protect the worker and members of the public from external exposure to radiation.

4.2.1 Perform an operational meter check prior to using a meter. Steps include verifying that the battery is sufficient, that the meter has been calibrated within the past year, and that the meter responds to a known source of radiation. Do not the meter if it does not pass all steps in the operational meter check.

4.2.2 Use a slow, sweeping "S-shaped" motion (5-8 cm per second) approximately 1 cm away from the surface being surveyed. Moving the detector too fast or being too far away from the source will decrease the detection efficiency.

4.2.3 Be careful to avoid sharp objects that may puncture the probe window.

4.2.4 Use a survey meter before taking swipes. This will help to identify any additional areas that may not be part of the routine swipe locations.

4.2.5 GMs are the preferred meter for most RAM uses on campus. NaI meters should be used for photon emitters. Note that GMs cannot detect low-energy beta emitters such as H-3; the best method of detection for low-energy beta emitters is using an LSC.

4.3 Swipe surveys should be performed to identify removable contamination.

4.3.1 Always wear gloves when performing swipe surveys.

4.3.2 Swipe areas with filter paper, or a similar material, making sure that the area swiped is 100 cm^2.

4.3.3 Suspected "hot" swipes can be checked with a survey meter and separated from the rest to minimize cross-contamination.

4.3.4 Potential swipe locations could include benchtops, keyboards, sinks, the floor in front of the door, the floor in front of the fume hood, fume hood lip, waste areas, desks, and other areas that are frequently used.

4.3.5 EHS Radiation Safety Staff (RSS) does not require predetermined locations or numbers of swipes. The number of swipes and locations should be based on the current work being performed and sufficient to identify contamination.

4.3.6 Swipes should also be performed whenever a spill or contamination event occurs. Refer to the SOP on spills for more detailed information on spill response and cleanup.

4.3.7 Swipes may not be required if a lab is only using sealed sources of RAM.

4.4 Documented surveys should be recorded on a survey map. An example survey map has been provided in Appendix A. To document a survey:

4.4.1 Record the locations where dose rates over the values identified in the RSM are found. Document these locations with a triangle and letter inside and record the dose rate on contact (approximately 1 cm) and 30 cm from the location. Determine if the dose rate is due to removable or fixed contamination by taking a swipe of the location as well. Compare the dose rates to the dose rate levels identified in the RSM to see what additional actions are necessary; most often, additional actions will include shielding the area for fixed contamination and decontamination for removable contamination.

4.4.2 Record the background dose rate.

4.4.3 Record the locations where swipe samples are taken. Swipe locations are designated with a circle and a number.

4.4.4 Include a printout of the swipe results.

4.4.5 Report removable contamination in DPM. If the instrument prints out in CPM, use the instrument's efficiency to convert to DPM.

4.4.6 For locations where swipes indicate removable contamination over the designated limits in the RSM, rerun the swipe to ensure contamination was truly present (and not a false positive) and save the results.

4.4.7 If contamination is found, include any decontamination efforts as well as the final swipe of the area documenting removable contamination below the limits in the RSM.

4.4.8 Record the make, model and serial number of the instrument used.

4.4.9 Record the date of the survey.

4.4.10 Initial the survey.

4.5 Refer to the RSM for the frequency at which documented meter and swipe surveys need to be performed. If daily undocumented surveys indicate removable or fixed contamination in excess of the levels found in the RSM, document efforts to minimize or

eliminate the contamination in the same manner as routine documented surveys. In general, survey frequencies are determined according to Table 2. These frequencies will be determined during the initial review of a new or updated procedure.

Table 2. Guidelines for developing documented survey frequencies.

	< 0.1 ALI	**≥ 0.1 ALI < 1.0**	**≥ 1.0 ALI**
In Use	Monthly	Weekly	Daily
Not in Use		Every 6 Months	

4.5.1 At minimum, anyone in possession of RAM must perform monthly documented surveys.

4.5.2 If no RAM is in possession for an extended period of time, then an operational meter check should be performed monthly and documented on the survey map.

4.5.3 If RAM is in possession but has not been used for an extended period of time, documented surveys still must be performed.

4.5.4 Meter surveys should be performed at the end of each day of use for all radiopharmaceutical elutions, preparations, assays, and administration areas (except patient rooms, which will be surveyed at the end of the therapy instead of on the day of administration) when using radiopharmaceuticals requiring a written directive.

4.5.5 Survey monthly all lab areas where only small quantities of gamma-emitting ram are used (less than 100 uCi at a time).

4.5.6 Survey weekly all radionuclide use, storage, and waste storage areas. If diagnostic administrations are occasionally made in patient rooms and special care is taken to remove all paraphernalia, those rooms do not need to be surveyed.

4.6 If contamination is ever found in unrestricted areas, it should be immediately decontaminated to background levels and reported to the Radiation Safety Officer.

4.7 Official records of surveys will include those performed during Radiation Safety Inspections and be maintained by EHS per 10 CFR 20.2103.

5. References:

5.1 NUREG 1556, Volume 7, Revision 1, Appendix I

5.2 NUREG 1556, Volume 7, Revision 1, Appendix M

5.3 NUREG 1556, Volume 11, Revision 1, Appendix H

5.4 NUREG 1556, Volume 11, Revision 1, Appendix L

5.5 NUREG 1556, Volume 9, Revision 3, Appendix R

5.6 10 CFR 20.1501

6. Revisions

6.1 Rev 01 – 2023-12-4 – New SOP.

Appendix A – Survey Map Template

See attached excel sheet for template.