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RCT Continuing Training: 1st Quarter 2022 Presentation Transcript

Slide #1.1 – 2022 1st Quarter Continuing Training

Slide #1.2 – Introduction

"Welcome to RCT Continuing Training. This training will discuss the process for: collecting and evaluating radiological air samples and submitting samples to HPAL. This training consists of viewing the online presentation and completing its associated exercise guide, Utrain number 53850. It is recommended that you have the exercise guide with you while following along with the online training"

Slide #1.3 – Terminal Objectives

"The terminal objectives covered for this quarter's continuing training are the following: Given the need to perform radiological air sampling, recognize the requirements of P121, *Radiation Protection* and RP-PROG-TP-200, *Radiation Protection Manual a*nd…Given the need to submit radiological samples to HPAL, recognize the requirements of P121, *Radiation Protection* and RP-PROG-TP-205, *Submitting Samples to HPAL."*

Slide #1.4 – Enabling Objectives

"The enabling objectives that will be discussed over the course of this training include: Describe the process to perform an air sampler filter change, explain the operation of a Lo-Vol giraffe air sampler, describe the process of an air sampler flow-rate verification, identify the considerations for air sampler placement, calculate DAC given HPAL air sample results, document air sample results, and describe the process for submitting samples to HPAL."

Slide #1.5 – Lesson Navigation Page

Slide #1.6 – Conclusion

"Congratulations! You have successfully completed the online portion of RCT Continuing Training. To receive credit for this training, you must now complete the Student Exercise Guide that has been provided to you. Once finished, email a copy of the completed guide to RP-Training@lanl.gov. Credit will be assigned for the exercise guide by the end of the quarter. Select the exit course button to close this training."

Slide #2.1- Radiological Air Monitoring

"Radiological air monitoring is performed to collect and analyze any potential airborne contaminants that workers or the public may be exposed to as a result of operations from radiological facilities. Airborne radioactivity is a concern due to the biological effects of ionizing radiation emitted by those contaminants. A comprehensive air monitoring program must be established to ensure all regulatory requirements are met and to control the intake of airborne radioactive material by workers. RCT's are responsible for correctly performing radiological air samples and for having the ability to interpret the results."

Slide #2.2 – Air Monitoring Program

"The primary objectives of an air monitoring program includes: Measuring the concentration of the radiological contaminants in the air, identifying the types and characteristics of the contaminants, evaluating any potential hazards to the workers from the airborne contaminants present, evaluating the performance of control measures set in place (Respirators, HEPA), and assessing the data to determine if bioassays are necessary. Air monitoring helps determine if the level of protection provided to the workers is sufficient to minimize internal dose received from airborne radioactive contaminants. "

Slide #2.3 – Terminology

"The inhalation of radioactive particles is the largest cause of internal dose in workplace incidents. Measuring airborne radioactivity is necessary to ensure that control measures are initially effective and remain effective throughout a job evolution. Regulations govern the allowable effective dose equivalent to an individual. The effective dose equivalent is determined by combining the external and internal dose equivalent values. Let's now go over some of the important terminology associated with airborne monitoring. Annual Limit on Intake or ALI is the quantity of a single radionuclide that, if inhaled or ingested in 1 year, would irradiate a person, represented by a reference man, to the limiting value for control of occupational exposure – a committed effective dose of 5 rem. The Derived Air Concentration, referred to as DAC is the concentration of a radionuclide in air, which if breathed over a period of a work year, would result in the ALI for that radionuclide being reached. The DAC is obtained by dividing the ALI by the volume of air, which equates to 2400 m3, breathed by an average worker during a working year. The Derived Air Concentration – hour or DAC-hour is the product of concentration of radioactive material in air, expressed as a fraction or multiple of the DAC for each radionuclide, and the time of exposure to that radionuclide, in hours. "

Slide #2.4 – DAC-hr to Dose Estimation

"DAC-hours play an important role in providing estimations for doses received in an area. This is achieved by comparing the ALI to the amount of DAC hours a worker can be exposed to in a year. A work year is assumed to be 2,000 hours based on working 50 weeks in that year at 40 hours per week. The 2,000 DAC-hours equates to 1 ALI, which equals a committed effective dose of 5 rem, or 5,000 mrem. Some quick division and unit cancellations shows 5,000 mrem divided by 2,000 DAC-hours equates to 2.5 mrem per DAC- hour. This thumb rule is used as an approximation to estimate dose received per DAC-hour exposed to. An actual dose calculation from bioassay monitoring should be performed to obtain an exposure report for an incident. "

Slide #2.5a – Physical States of Airborne Radioactivity

"Airborne radioactive contaminants are generally divided into three categories based on their physical state. These are: particulates, gases, and vapors. The physical properties of airborne radioactive particles can affect inhalation deposition, their dynamic properties in air, and particle solubility in the lungs. Use the slide on the bottom of the screen to navigate through the different physical states of airborne radioactivity."

Slide #2.5b – Particulates

"Particulate contaminants are solid and liquid particles, ranging in molecular sizes, which are suspended in air. Examples of solids include fumes, dusts, and smokes, and examples of liquids would be mists or fogs, depending on the dispersion of the liquid particulates. Retention of particulates in the lungs is highly dependent on their size and solubility. Dissolution of particles into the lungs allows them to enter the blood system and disperse throughout the body."

Slide #2.5c – Gases

"Gases are substances that, under normal temperature and pressure exists in a gaseous state. The retention of gases in the body from inhalation is poor, so, radioactive gases are usually treated as an external source of exposure. Examples of gases include fission product gases, such as xenon and krypton, and naturally occurring radon."

Slide #2.5d – Vapors

"Vapor is considered the gaseous phase of a substance that is typically a solid or liquid under normal temperature and pressure conditions. The contaminant may be dispersed in a vapor form under abnormal conditions. As pressure and temperature return to normal conditions, the contaminant will return to a solid or liquid form. Absorption through the skin can be a concern with vapors. Tritium is an example of a radiological vapor contaminant."

Slide #2.6 – Types of Air Samplers

"Air sampling equipment must be used where an individual is likely to receive an exposure of ≥ 40 DAC-hours/year and when directed by an RWP. There are different methods to sample for airborne radioactivity. The five primary types of samplers are: personal air samplers, high volume flow rate, low-volume flow rate, portable continuous air monitors, and installed continuous air monitors."

Slide #2.7 – Representative Sampling

"Radiological air sampling should be representative of what people in the vicinity are breathing. This is especially important while performing job coverage. One way to ensure this is done is to have the sampler flow rate obtain an air sample at approximate the breathing rates of the individuals in that area. Two cubic feet per minute is the desired flow rate for low-volume air samplers. Let's review why this specific number is used. The average breathing rate of a resting adult is around 12 liters per minute. For moderate work such as lifting, kneeling, squatting, and wearing a respirator the breathing rate climb up to 60 liters per minute. The low-volume air sampler, or giraffe, commonly used reads out in the units of cubic feet per minute. So now we will do some unit conversion. One cubic foot equals 28.3 liters. Using the moderate work breathing rate of 60 liters per minute we will divide it by 28.3. Seeing how the units end up canceling each other out, we end up with a total of 2.12 cubic feet per minute. This is why it is important to ensure the air sampler flow rate is set a 2 cfm, plus or minus .25."

Slide #2.8 – Low-Volume Air Samplers

"The continuous duty constant flow air sampling system, often referred to as a giraffe or gooseneck, is a low-volume air sampler. This is frequently used in the radiation protection industry. This model has a telescoping neck which is great for establishing breathing and work zone air sampling. It is designed to operate for extended periods of time, which makes it useful for general air monitoring for RMI's and job coverage. . Click the markers to read more on the features of this type of air sampler. "

Slide #2.9 – Portable Continuous Air Monitors

"Continuous air monitors provide real-time monitoring to detect and provide warning of airborne radioactivity concentrations that warrant immediate action to terminate inhalation of airborne radioactive material. These real-time air monitors must have an alarm capability and enough sensitivity to alert potentially exposed individuals that immediate action is required to minimize or terminate inhalation exposures. The Canberra Alpha Sentry and AMS-4 Beta CAMs are examples of continuous air monitors used at LANL."

Slide #2.10 – Air Monitor Placement Determination

"RP-PROG-TP-200, section 624.3 discusses the process for air monitor placement determination. An air monitor placement determination is required when documenting baseline permanent air monitoring configurations. If air monitoring is required in an RWP, then air monitor placement must be documented in the RWP package. Consider the following when selecting the location and number of air samplers or monitors: size of the area or facility, type of operation conducted at the facility, contamination levels and potential for contamination, traffic patterns, air flow patterns, facility features, locations with high source-term potential, and historical air monitoring results. We will now go into some detail on why these matter for air sampler locations."

Slide #2.11 – Size of the Area or Facility

"The size of an area or facility is a factor due to the potential for needing multiple air samplers to get an accurate representation of the area. Consider the map below. Two low-volume air samplers are in the truck bay as well as a beta CAM. This can be due to different requirements from a job specific RWP, an RMI, or a FRPR. Having just one running in that area may not be sufficient for the given area and work being performed."

Slide #2.12 – Operations Conducted

"The operations conducted at a facility will determine what type of air sampling is required. In order to capture and analyze a representative air sample, an instrument that has the capability to collect the specific type of radioactivity must be used (alpha, beta). Working with alpha contamination would require an Alpha Sentry CAM while being at a facility that deals with radioiodine would require an air sampler with an iodine cartridge."

Slide #2.13 – Contamination Levels in the Area

"Contamination levels of an area can be an issue when selecting air sampling equipment due to the potential of stirring up the contamination from the pump and motors. Starting up a low-volume or high-volume air sampler in an area of higher contamination can potentially create an Airborne Radioactivity Area. If an air sampler has to be used in a CA, good practice is to place it on a piece of yellow Herculite or Masslinn prior to starting."

Slide #2.14 – Traffic Patterns

"Traffic patterns are a concern due to the potential of the air sampler becoming a tripping hazard or getting in the way of a worker while performing a job. An RCT should place it in an area that will get a representative sample while not being a danger to the people in the area. This is especially important while performing job coverage. Discuss with the workers prior to commencing the work to verify the sampler placement will not interfere with them."

Slide #2.15 – Airflow Patterns

"Airflow patterns are conducted to get an idea of how air moves in that specific room or facility. The tests can be done with items such as a smoke stick or fog machine. Typically, airflow studies are done to establish a facility baseline on where air samplers should be stationed for long-term monitoring or job-specific evolutions. An RCT will not usually conduct these tests, but should understand that they exist and why they are conducted."

Slide #2.16 – Facility Features

"Facility features can provide an RCT guidance on where to place an air sampler by reviewing items such as air exhausts, supplies, and fans. Examining a room for these types of features can help an RCT understand the characteristics of where the air will travel, and better prepare them on where to place the air sampler. An RCT should also be aware of the possible effects of securing or starting the ventilation in the area as well."

Slide #2.17 – High Source Term

"A high source term location is an area that contains a large concentration of radioactivity, which if disturbed or compromised may lead to a radiological event to occur. Examples of an area with a high source term potential are glove boxes, resin beds, and hot cells. Having air samplers in these areas can give workers early indications of an abnormal condition, or allow for airborne concentrations post-job to be determined."

Slide #2.18 – Historical Results

"Reviewing the historical results of airborne radioactivity levels is a great tool for an RCT to use. This data will improve planning and ensure proper measures are taken prior to starting the work. When an RCT is writing an RWP or preparing for job coverage, it is beneficial to review any previous air sampling data. Doing this can help verify RWP suspension limits are sufficient, and ensure proper PPE is being used."

Slide #2.19 – Knowledge Check

Slide #2.20 – Air Monitor Placement

"Continuing along in RP-PROG-TP-200 for air monitor placement determination, the procedure states to refer to NUREG-1400, *Air Sampling in the Workplace* for additional guidance in selecting placement of air sampling equipment. If an airflow study is performed, then document the results using a map. Air sampler inlets must be placed strategically such as between workers and point of release, in appropriate air flow locations, in an area representative of breathed air. If strategic placement of air samplers cannot be achieved, then breathing-zone monitoring must be performed."

Slide #2.21 – Starting an Air Sample

"Obtain a new, clean air filter and mark the non-collection side with an "X". The collection side, as seen in the picture, has a surface that can be easily scraped off. While the non-collection side has a fibrous appearance and is difficult to remove. Do not use a marker that bleeds through the filter. Remove the air sampler retaining ring from the sampler head and insert the new filter, ensuring any previous sampling material is removed. Remember to make sure the "X" is on the backside of the filter when placing it on the head. Inspect the gasket/ring for damage or deterioration. Replace the air sampler retaining ring."

Slide #2.22 – Starting an Air Sample

"Start the pump. Note the time started and indicated flow rate on the sample rotameter. Ensure flow is 2 CFM plus or minus 0.25. Adjust the flow control valve to achieve this flow if needed. If flow cannot be maintained in this range, secure the pump and tag out of service until a flow rate verification can be performed. Record the air sample start date, time, and initial flow rate. This can be done on the air sample filter envelope, a logbook, or another facility specific recording process. HPAL requires these values to calculate the activity concentration of the air sample."

Slide #2.23 – Flow Rate Verification

"Flow rates for portable air samplers with rotameters must be verified annually at a minimum, and frequency must be included in facility Routine Monitoring Instructions (RMIs). If starting a new RP-PROG-FORM-020, *Air Sampler Flow Rate Verification*, then record the following: date and time, TA and building, calibration rotameter model, calibration rotameter number, and rotameter calibration due date."

Slide #2.24 – Flow Rate Verification

"For each air sampler, record the following in a new row: room, air sampler number, and required flow rate. Verify the calibrated rotameter is within calibration. Place a clean filter that is identical to the filter type used for air monitoring in the rotameter. Remove the filter holder from the air sampler. Ensure the air sampler rotameter is oriented within 15 degrees of the vertical position."

Slide #2.25 – Flow Rate Verification

"Start the air sampler pump. Take the rotameter readings at the middle of the floating ball. Record the calibrated rotameter CFM reading in the As Found column on RP-PROG-FORM-020. The air sampler may either have a regulated air pump of flow control valve. Reference the associate section of RP-PROG-TP-200 to adjust the flow between 1.75 and 2.25 CFM. If the air sampler rotameter does not read between this range, then remove the rotameter from service and inform the HPFC. If the air sampler passed, then complete an air flow verification label and attach to the air samplers rotameter."

Slide #2.26 – Collecting an Air Sample

"When collecting an air sample, there are a few steps that need to be performed to ensure accurate results will be obtained. Note the reading on the rotameter prior to securing the pump. These pumps, although designed for long-term continuous use, have a potential for the flow rate to drift up or down. Even a small fluctuation of 2.0 CFM to 1.8 CFM over a long period time can create a large difference in the total volume collected. Remember, HPAL needs the initial and final flow rates for the air sample activity concentration determinations. Secure the pump and record the stop time, date and flow rate."

Slide #2.27 – Collecting an Air Sample

"Remove the air sampler retaining ring, remove the air filter from the sampler head using clean gloves or tweezers, place the filter in an envelope or tray, inspect the gasket/ring for damage or deterioration, place a new filter on the sampler head if a new sample needs to be started and replace the air sampler retaining ring. Gloves must be worn when handling air samplers."

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Slide #2.28 – Field Screening

"A field screen of the air sample filter should be conducted to verify conditions of the area are as expected and to ensure HPAL limits are not exceeded. When performing a field screen, the following are best practices to prevent the spread of contamination and get an accurate reading. Do not perform while the filter is still in the sampler head. This does not allow the probe to get within 1/4" of the filter, contamination (loose and fixed) from the sampler head can give false readings, and background radiation levels in the area may not allow for a direct reading. Remove the air filter from the envelope in an area of low background, place the filter on a clean and flat surface. Frisk hands and change gloves when necessary. Using an appropriate contamination instrument, perform a frisk of the air filter at a distance of 1/4". Wait for counts to stabilize to obtain your reading."

Slide #2.29 – Value of Concern

"If the field screen count rate is >4,000 dpm (combined alpha and beta), then recount the air filter after 30 minutes. If the air filter count is <4,000 dpm after waiting 30 minutes, then submit the sample to HPAL. If the air filter count rate is still >4,000 dpm after 30 minutes, then notify the HPFC. What is this 30 minute wait for? This is to account for any radon that has accumulated to decay. Typically, if the counts are from radon, they will decrease approximately 50% after the thirty minute wait. As an RCT, you may encounter this short-lived naturally occurring radioisotope on a regular basis. Understanding where it comes from and how it decays can help an RCT better distinguish radon from actual contamination."

Slide #2.30 – Sources of Radon

"Radon is an inert gas that does not pose a significant health hazard. When taken into the body and lungs, the majority of it will be exhaled back into the environment. The concern with radon is the non-gaseous radioactive daughters that are produced from decay. These products can easily attach themselves to air, vapors, or particulates which can then be taken and retained in the body. All naturally occurring heavy nuclides (Z>83) are part of one of the following series: Radium, Actinium, and Thorium. Each of these series contains a gaseous state of radon (Rn) and ends in a stable isotope of lead (Pb). Due to the very short-lived radon isotopes and the less commonly

found Uranium-235, the Radium and Actinium series are not a major concern for radon concentrations detected by RCTs. The major contributor of radon is from the Thorium series."

Slide #2.31 – Rn-222 Decay Series

"Here is the process of the radioisotope Radon 222 decaying down to the stable lead 206. As seen this is a relatively fast process."

Slide #2.32 – Radon Characteristics

"The best way to determine whether the source of contamination is a result of radon is to wait and allow it to decay. However, radon does have certain characteristics that an RCT can use to decide if radon is a likely cause for elevated counts. Some of these include: frequent PCM alarms on snowy days, the detected contamination on an individual moves from location to location, and both alpha and beta contamination are found. As an RCT, some of these radon traits will become more apparent over time. But it is important to never assume contamination found is from radon. Always follow facility specific guidance and consult with an HPFC if radon is suspected."

Slide #2.33 – Submitting Air Samples to HPAL

"After you have performed your field screen counts of the air filters it is time to submit your samples to HPAL for further analysis. To properly document and transport the air samples, RP-PROG-TP-203 *Packaging and Transporting Requirements for RP Activities* and RP-PROG-TP-205 *Submitting Samples to HPAL* will need to be used. This process is discussed in the HPAL section of this training."

Slide #2.34 – HPAL Results

"After receiving the HPAL Analysis Report, the results should be reviewed to determine if any activity was detected. The alpha activity for the air sample is NDA and the beta is 83.74. Notice that the units for this readout are in dpm/m3. To translate this activity into a DAC fraction we will need to convert these to μCi/mL and then divide that value by the associated radionuclide DAC value."

Slide #2.35 – Sample Unit Conversion

"To convert the alpha or beta activity units to µCi/mL, you will use the conversion equations shown here. This equation acts as a unit conversion where the only variable that will ever change is your sample activity in dpm per cubic meter. So for this example we will put the 83.7 dpm in for the x placeholder. In the denominator, 2.22E6 is multiplied by the 10 to the 6^{th} power. The units are crossed out to result in 83.7 micro curies over 2.22E12 mL. Dividing these numbers gives us a total activity concentration of 3.77 times ten to the -11^{th} power micro curies per milliliter. Now that the activity is in the correct units, it is time to compare them to the DAC value."

Slide #2.36 – DAC Fraction Conversion

"A DAC Fraction is obtained from dividing the activity previously calculated by a DAC value. If the radioisotope from the air sample is known, then this number can be found directly in 10CFR835, *Occupational Radiation Protection*, Appendix A, as shown below. If the isotopes of the air sample are unknown, beta and alpha DAC values are also provided in appendix a. These numbers are 4E-11 for beta emission, and 2E-13 for alpha emission. Notice how the alpha DAC value is substantially smaller than the beta value. This is due increased biological damage alphas may impose compared to beta, leading the DAC value to be more restrictive. In this example the beta activity comes from an unknown radioisotope, therefore we will use 4e-11 as the DAC value. To get the DAC fraction from the calculated activity concentration determined in the previous slide, we will divide the 3.77 E-11 micro curies per milliliter by 4 E-11 micro curies per milliliter, resulting in a DAC fraction of 0.94. Notice this value is unit less do to them cancelling each other out. Most facilities are aware of the most restrictive DAC. Consult with your HPFC or facility HP if you have questions on air sample results."

Slide #2.37 – Multiple DAC Fractions

"There may be times when an air sample will have detected activity for both alpha and beta. To determine the DAC fraction when this occurs the same process as the previous example will need to be performed, and then the DAC fractions will be added together to get a total sum of DAC. In this example we have an alpha activity of 8.09 dpm/m3 and a beta activity of 124.75.

These sources of the activity are unknown, therefore we will use the DAC values for unknown radioisotopes shown in the previous slide. The first thing that needs to be done is to convert the dpm/m3 to micro curies/mL. Using the same equation as the last equation the activity is divided over 2.22E12 resulting in 3.64 E12 micro curies per mL. This is then divided by the unknown alpha DAC value, which gives us an alpha DAC fraction of 18.2 The same process is done for the beta activity, using the unknown beta DAC value, to get a beta DAC fraction of 1.4. Now to get the Sum of DAC you simply add these two together to get a total DAC fraction of 19.6."

Slide #2.38 – Knowledge Check

Slide #2.39 – Airborne Postings

"Knowing the DAC levels in an area is necessary to ensure proper measures are in place and the correct actions are taken if limits are exceeded. This may include the need to stop work due to an RWP suspension limit being exceeded, upgrading respiratory equipment with a higher protection factor, or posting a room as an Airborne Radioactivity Area. There are two different DAC fractions of concern which may require the need to post an area as an ARA. The first is where the DAC is equal to or exceeds 1 in any accessible area where the concentration of airborne radioactivity, above natural background, exceeds or is likely to exceed the DAC values listed in Appendix A or Appendix C of 10 CFR 835. The second value of concern where an area needs to be posted as an ARA is if the DAC value is 0.3 and the area is one in which an individual without respiratory protection could receive an intake exceeding 12 DAC-hr in a week. As mentioned in the beginning of this lesson, airborne monitoring is a critical aspect in a Radiation Protection Program. RCTs need to know their procedural requirements when performing radiological air monitoring and have an understanding of the theory behind what they are doing."

Slide #3.1 – Health Physics Analysis Laboratories

"The Health Physics Analysis Laboratories (HPAL) conducts radio analytical services and bioassay monitoring. Non-destructive radioactive sample analyses are performed in support of LANL Radiation Protection and Environmental Stewardship programs. Some of the analytical capabilities include gross alpha/beta counting, liquid scintillation analysis, and isotopic analysis. RCT's are responsible for complying with the procedures of documenting, packaging, and submitting radiological samples to HPAL."

Slide #3.2 – HPAL Location

"HPAL is located in TA-3, building 2010. It can be reached by going southbound on Diamond Drive and making a right on Pajarito road. Taking the next left you will see Occupational Medicine to your right and the road will take you to an area to park as seen here on the map."

Slide #3.3 – Accessing HPAL

"The HPAL webpage can be found on the Radiation Protection LANL Inside homepage. Here you can view the HPAL contact information, descriptions of the analytical capabilities, access to sample results, and a link for the HPAL Sample Submittal Form, RP-SVS-HPAL-001.
In this training, we will go over the requirements on how to prepare the samples, filling out the submittal form, what to do when arriving at HPAL, and how to track and log out your samples after they have been analyzed. To view HPAL results, the Radiation Protection Application Catalog can be used to access the HPAL data retrieval page seen here."

Slide #3.4 – HPAL Sample Types and Analysis

"Here is a table that shows some of sample types and analyses that HPAL performs. In the top row you can see samples such as smears, air filters, activity reports, tritium smears, liquids, oils, nasal smears, tritium air filters, charcoal filters and a section for other. Analytical methods include gross alpha and beta counts, liquid scintillation, isotopic analysis, leak tests, and source standardizations. Contact is written in some of the boxes, which is asking the submitter to contact HPAL to give them more information on the sample that needs to be analyzed. We will go into more depth on how these different samples are expected to be submitted."

Slide #3.5 – HPAL Procedure

"This procedure provides the precautions and limitations of submitting samples to HPAL, guidance on sample preparation, batch preparation, and step-by-step instructions on how to fill out the HPAL Sample Submittal Form. The different sample types covered in RP-PROG-TP-205 includes smears, air filters, liquid scintillation samples, charcoal filters, nasal smears, tape presses, and personal protective equipment samples. We will now go over some of the different ways samples are prepared."

Slide #3.6 – Sample Preparation

Slide #3.7 – Batch Preparation

"Now that we have reviewed how to prepare the sample, let's go over the process on how to submit the samples. Separate samples into batches according to both the sample type and analysis. Do not combine different sample types in a batch and also ensure different sample analysis are not combined. Separate submittal forms will need to be made it multiple sample types or analysis are needed to be submitted. If some of the samples within a batch will require an emergency or priority analysis, then prepare a separate batch for each priority type."

Slide #3.8 – Batch Preparation

"Ensure the number of samples within a batch does not exceed the HPAL maximum, as seen in the table here. Package each batch separately for transport per instructions in RP-PROG-TP-203, *Packaging and Transporting Requirements for RP Activities.* Place a sample tracking barcode on the primary container of the batch such as a plastic bag. When submitting disk smears, ensure each one is numbered and they are stapled together in groups of 10, if applicable."

Slide #3.9 – Knowledge Check

Slide #3.10 – HPAL Sample Submittal Form

"Now we will discuss the process on how to properly fill out the HPAL sample submittal form. This form can be found on the HPAL webpage, or by accessing it through EDRMS. The form can be found under the forms folder in the RP-SVS section of EDRMs. A sample submittal form is needed for each batch that will be submitted. Do not combine different sample types or analysis in a batch. Enter the following information in block number one. Date of the sample, number of samples. Submitter name and Z # with their contact information. Name, Z #, phone, pager, and email information of the individual to be contacted with priority or emergency results. And the deployed group or organization of where the samples are being submitted from."

Slide #3.11 – HPAL Sample Submittal Form

"If the sample requires priority or emergency analysis, check the associated box. Enter the sample tracking number by doing the following. If completing the form manually, then place a sample tracking barcode sticker in Block 3 with the same barcode number as the sticker attached on the sample container and associated survey form. If completing the form electronically, then type the same barcode number from the sample and survey. Matching barcodes should be on the sample package, HPAL submittal form, and associated survey. Dispose of any extra barcode stickers."

Slide #3.12 – HPAL Sample Submittal Form

"Select the sample type(s) and desired analyses in Block 4. If multiple analyses are required for a sample type, then check all boxes that apply and add comments in Block 5. If submitting samples for isotopic analysis, leak tests or source standardizations, then compete the nuclide information in Block 4. Enter any known or suspected nuclides, or enter "See Below" and list the nuclides in Block 8, or enter "see attached" and list nuclides on an attached survey form. Enter the total batch alpha and beta field screen results, or the highest individual sample alpha and beta field screen results, whichever is higher."

Slide #3.13 – HPAL Sample Submittal Form

"If a prompt notification by HPAL of elevated results is required, then select the "> NDA" checkbox for notification of any positive results, or select the "Other" checkbox and enter a specific value for the contact "Notification Limit" in BLOCK 5. Enter any additional analyses, comments or directions to HPAL in BLOCK 5. Examples include, "Return samples to submitter", or "Perform isotopic analysis on positive samples". If the samples are part of an RPIN, RWP, or work control document, then enter applicable information in BLOCK 6."

Slide #3.14 – Notification Limits

"HPAL needs to be contacted prior to submitting any samples exceeding their notification limits. The use of field checks and historical data can help prevent these limits from being violated. The notification limits are the following: 5,000 dpm for alpha contamination, 10,000 dpm for beta contamination, a contact beta and gamma dose rate of 0.5 mR/hr, and 400,000 dpm for tritium contamination"

Slide #3.15 – Hazardous Materials

"When submitting samples to HPAL, non-radiological hazards need to be considered as well. RP-PROG-TP-205, Attachment A – *Hazardous Materials Guide for HPAL Submissions,* lists the different types of materials accepted and not accepted by HPAL. Some of these materials not accepted by HPAL include flammables, reactive materials, and organic peroxides. It is important to reference this procedure or to contact HPAL when unsure about whether a certain material may be sent for analysis. If an approved hazardous material is going to be submitted, annotate this on the sample submittal form by selecting the box in Block 7 and list all known hazardous materials."

Slide #3.16 – HPAL Sample Submittal Form

"After filling out the previous sections of the submittal form, you will then complete the appropriate blocks based on the type of samples that are being submitted. Make sure all of the required information is filled in correctly and boxes checked, such as flow rate units and if a respirator was worn. These blocks include: # 8 smears/liquid and other, #9 air filter / CAM/ FAS/ charcoal, and block # 10 nasal smears. Remember, each form can only have one sample type and one analysis method selected. The backside of the submittal form contains extra spaces for sample information to be entered in case more room is needed. Once the form has been filled out it is now time to take the samples to HPAL. "

Slide #3.17 – Knowledge Check

Slide #3.18 – Packaging Solid HPAL Samples

RP-PROG-TP-203, *Packaging and Transporting Requirements for RP Activities* provides guidance on how to transport the HPAL samples. The first step is to verify, if applicable, the total activity levels are less than the limits stated in 4.1.1, and take actions as described if levels are greater. Place samples in sealable plastic bags. Mark the bag with a CAUTION RADIOACTIVE MATERIAL label. Place the bags in an RP-approved shipping container. Perform an on-contact dose rate survey on the exterior of the container and note the readings. Verify dose rates are < 0.5 mrem/hr. If levels are ≥ 0.5 mrem/hr, take appropriate actions from the procedure. These actions include methods such as separating the samples into multiple packages until levels are below the shipping limits. Once you verify you are within you limits you will then, place a UN 2910 tag on the outside of the shipping container."

Slide #3.19 - Packaging Non-Tritium Liquid HPAL Samples

"Verify, if applicable, the total activity levels are less than the limits stated in 4.1.2, and take actions as descried if levels are greater. Place absorbent material on the bottom of an RP approved shipping container. Place the samples in an RP-approved shipping container tray Mark the tray with a CAUTION RADIOACTIVE MATERIAL label. Inner packaging containing liquids must be packaged and maintained with their closures upward.
Place tray in the shipping container and perform an on-contact survey on the outside of the container. Verify levels < 0.5 mrem/hr. Take similar actions as with solid samples levels exceeding 0.5 mrem/hr. Mark the outside of the container with a UN2910 label."

Slide #3.20 Packaging Tritium Samples

"Tritium samples mixed with other radionuclides may not be packaged using instructions in this section. Inner liquid containers must not be filled more than ¾ to the top to allow for expansion and prevent spilling when opened. Verify, if applicable, the total activity levels are less than the limits stated in 4.1.3, and take actions as descried if levels are greater. Place absorbent material in the bottom of a durable, leak-proof container. Place the samples in the container such that the samples are maintained with closures in an upright position during transport."

Slide #3.21 – Transportation of Samples

“Transport the packages to their destination by hand-carrying the containers, or via a U.S. government vehicle. If transporting in a government vehicle, then ensure all packages are secured within the vehicle. Maintain control of RAM samples, sources, and instruments at all times during transport. If a container is compromised during transportation or any anomalies occur, then immediately contact your HPFC for further actions.”

Slide #3.22 – Arriving at HPAL

“When arriving at HPAL with the samples and submittal form you will need to log them into the HPAL tracking system. Scan your badge or type in your Z number, select the Login Samples button, fill in the sample information and batch priority, enter the contact information for the sample, indicate if any of the samples potentially of activity greater than the notification limits Select the desired analysis, request the actions to be taken if activity is detected, select the sample type, enter any comments for the analyzer or to appear on report, and lastly, view and print the summary page.”

Slide #3.23 – Sample Drop-Off

“Verify the information on the forms match and the point of contact can be reached when the analysis is complete. Attach the Supplemental Sample Login Information sheet to the HPAL Submittal Form and the samples. To prevent a spread of contamination, ensure the staple is above the sealing portion of the sample bag. If the sample has a priority/emergency status, make sure that HPAL is aware prior to leaving. Make sure all the samples are properly labeled and inside of a plastic bag (including liquids) when placing in the appropriate bins.”

Slide #3.24 – Picking Up and Logging Out Samples

"HPAL will dispose of most low-level smears, air samples, and low-volume liquid waste after the analysis is complete. RCTs are expected to pick up their samples containing levels of higher contamination and larger liquid volumes, and to dispose of them according to their local facility guidelines. It is the responsibility of the RCT to log their sample out of the HPAL sample tracking system once they are collected or disposed of. Over 200,000 samples are analyzed at HPAL in a given year. In order to create a smooth process, follow the guidance of RP-PROG-TP-203 and RP-PROG-TP-205 while submitting radiological samples, and reach out to the HPAL office whenever there is a question or concern."

Slide #3.25 – Total Alpha/Beta Activity Samples

"Total alpha and beta activity samples. Mark each sample individually for identification. Do not use a marker that will bleed through the sample. Underline sample numbers that can be misread. Ensure sample dimensions are less than 50 mm in diameter, or 50 mm at the greatest dimension, if it is not round. Ensure all sample material is non-dispersible by removing any excess material that is not adhering to the sample media. If a sample is wet, then ensure media is allowed to dry before packaging. If the side of the sample media to be analyzed is not apparent, then mark the non-active side of the sample."

Slide #3.26 – Isotopic Analysis Samples

"Isotopic Analysis. If submitting tritium or nasal smears for isotopic analysis, then contact HPAL for preparation instructions. Remove any portions of the sample that are known not to have activity present. For example, remove sections of an LAS or PPE item with no activity. Prior to packaging, perform a field screening measurement of the sample to determine the estimated activity. Verify each sample is less than 70 mm at its greatest dimension, or is easily compacted to this size. If the sample cannot be reduced to this size, then contact HPAL. Package samples for isotopic analysis in individual bags and mark each bag individually for identification."

Slide #3.27 – Liquid Scintillation Samples

"Liquid Scintillation Samples. Mark each LSC sample vial or other container individually. Do not mark directly on smears or filters and be sure not write on the side or bottom of the LSC vial. Only write on the cap. Ensure LSC vials are not leaking. If submitting an oil sample, then provide at least 5 mL of oil. If submitting a water sample, then provide at least 10 mL of water. Leaking samples will be returned to the submitter unanalzyed. Sample types appropriate for LSC must be soluble or become transparent in the LSC cocktail. These include tritium smears, nasal smears, water samples, and light colored oil samples. Bulk samples cannot be measured by LSC. Acidic or basic samples also cannont be accepted for LSC analysis. Suspect nuclides appropriate for liquid scintillation analysis include alpha emitters, low-energy beta, and low energy photon emitters."

Slide #3.28 – Source Standardizations

"Source standardizations. Leak check sources prior to submittal. Leaking sources will not be standardized by HPAL. Identify any nuclides associated with each source on the submittal form. Package and transport source standardization samples in accordance with RP-PROG-TP-203, *Packaging and Transporting Requirements for RP Activities.* Sources requiring standardization include instrument calibration and check sources where knowledge of the true activity is required. Response check sources used only for their emission rate relative to a previous measurement normally do not require standardization."

Slide #3.29 – Leak Test Sample

"Leak test samples. Collect and package leak test samples for analysis in accordance with applicable preparations sections, and the analysis guidance in Table 1. Identify any nuclides associated with each source on the submittal form. If the source is an accountable sealed source, then obtain the RSSDMS ID number for inclusion on the submittal form. Leak test samples include smears taken from sources for leak-testing purposes."