Version 2.0
(January 2017)

Emergency Responder Health and Safety Manual

Chapter 8

Radiation Safety Program

Final

Customized for Region 4 on April 14, 2020

U.S. Environmental Protection Agency

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LIST OF ACRONYMS

ACL	Administrative Control Level
ALARA	as low as reasonably achievable
ARL	action reference level
ARST	advanced radiation safety training
BRST	basic radiation safety training
CFR	Code of Federal Regulations
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
HASP(s)	health and safety plan(s)
HQ	Headquarters
ID	identification
mrem	millirem
NRC	U.S. Nuclear Regulatory Commission
NRF	National Response Framework
OLEM	Office of Land and Emergency Management (formerly called Office of Solid Waste and Emergency Response (OSWER))
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
REM	roentgen equivalent man
RERP	Radiological Emergency Response Plan
RPM	Remedial Project Manager
RSO	Radiation Safety Officer
SHEM	safety, health, and environmental management
SHEMP	Safety, Health, and Environmental Management Program
SOP	standard operating procedure
SRD	self-reading dosimeter
SSD	Safety and Sustainability Division (formerly called Safety, Health and Environmental Management Division (SSD))
TLD	thermoluminescent dosimeter
XRF	X-ray fluorescence spectroscopy

1.0 INTRODUCTION

1.1 Background Information and Regulatory Basis

The U.S. Environmental Protection Agency's (EPA's) emergency responders have the potential to be exposed to ionizing radiation. This chapter describes the minimum requirements that EPA organizations must meet to minimize such exposures and to uphold the three principles of EPA's dose limitation system (see Text Box 1). EPA's radiation safety program ensures that emergency responders:

- Receive basic and advanced radiation safety training (see Section 3);
- Participate in a personal monitoring program (see Section 4);
- Understand the monitoring procedures associated with protecting a pregnant employee and her unborn embryo/fetus (see Section 4.2.5);
- Understand how to use, maintain, and calibrate radiation detection equipment (see Section 5); and
- Understand how to safely use equipment that contains radioactive sources (see Section 6).

This chapter also describes recordkeeping practices that EPA organizations must follow (see Section 7) and outlines program evaluation procedures that must be conducted to ensure that local-level radiation safety programs are performing adequately (see Section 8).

Text Box 1
EPA's Dose Limitation System

EPA's dose limitation system is based on three principles:

- **Justification**: there should not be any planned occupational exposure of employees to ionizing radiation without the expectation of an overall benefit from the activity causing the exposure.
- **Optimization**: a sustained effort should be made to ensure that collective doses, as well as annual, committed, and cumulative lifetime individual doses, are maintained as low as reasonably achievable (ALARA).
- **Limitation**: radiation doses received as a result of routine and/or emergency occupational exposure should not exceed EPA's Administrative Control Level.

EPA's Safety, Health, and Environmental Management (SHEM) Guideline 38 (entitled *Radiation Safety and Health Protection Program*) serves as the basis for this chapter. Other documents used to develop this chapter include:

- The U.S. Nuclear Regulatory Commission's (NRC's) Standards for Protection Against Radiation (10 CFR Part 20);
- The Occupational Safety and Health Administration's (OSHA's) Ionizing Radiation standard (29 CFR 1910.1096);
- NRC Regulatory Guide 8.13 Instruction Concerning Prenatal Radiation Exposure;
- Title VII of the Civil Rights Act of 1964 (regarding discrimination in employment);
- EPA's Manual of Protective Action Guides and Protective Actions for Nuclear Incidents (EPA 400-R-92-001);
- EPA's Memorandum on Turnback Guidance for EPA Personnel Responding to Radiological Emergencies, dated December 7, 2006; and
- The U.S. Department of Homeland Security's (DHS's) Protective Action Guides for Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents (Federal Register 71: 1 [03 January 2006], pages 174-196).

1.2 Instructions for Users

In accordance with OSWER Directive 9285.3-12, this chapter must be implemented across all EPA regions, the Environmental Response Team (ERT), the Consequence Management Advisory Team (CMAT), and Headquarters (HQ). This means each EPA organization must adopt the minimum Agency requirements and management practices listed in the chapter and produce a customized version of the chapter which is reviewed/updated on an annual basis.

To customize the chapter, users must (1) complete Appendix A and (2) insert organization-specific information into the blank spaces (highlighted in yellow) that appear throughout the chapter. If EPA organizations advocate additional policies and procedures exceeding the minimum Agency requirements, they must document them in Appendix B. Tools have been developed to support this chapter, including a glossary (see Appendix C) and the Radiation Safety Program Quick Reference Guide for emergency responders, found in the Field Guide described in Section 4.4 of the Introduction to this manual. Instructions for incorporating an organization's radiation safety program into the site-specific health and safety plan (HASP) are included in Appendix D.

See the Introduction to this manual for details on customizing and posting an organization's radiation safety program to EPA's Web site (http://www.epaosc.net/_HealthSafetyManual).

2.0 ROLES AND RESPONSIBILITIES

Removal Managers, Safety, Health, and Environmental Management Program (SHEMP) Managers, Radiation Safety Officers (RSOs), Health and Safety Program Contacts (HSPCs), supervisors, individual emergency responders and others have roles and responsibilities in implementing the Agency's radiation safety program. Appendix A details the tasks that these key personnel must perform. If an organization wishes to delegate a task to someone other than the default assignment in the appendix, users can do so when they customize Appendix A and when they fill information into the yellow-highlighted areas that appear throughout the chapter's text. *(Note: Many tasks have been assigned to an entity referred to as the "RSO or SHEMP Manager" to acknowledge that there is variability across the Agency in the way that responsibilities are split between these two positions. Users must indicate which specific position will be held accountable for each task when they go through the process of customizing this chapter.)*

3.0 RADIATION SAFETY TRAINING

3.1 Radiation Safety Training Requirements

Sections 3.1.1 through 3.1.3 identify training that EPA emergency responders must take, and Text Box 2 indicates when the requirements must be met. The RSO or SHEMP Manager (or another designated person) must ensure that emergency responders receive the necessary training, appropriate proof is obtained to document the successful completion of training (see Section 3.2 for details), training requirements are tracked in the Emergency Management Portal, Field Readiness Module, and the Removal Manager (or his/her equivalent) is aware of which employees have/have not completed their training requirements. The HSPC (or another designated person) may be called upon to assist with these tasks. To support the training effort, the Removal Manager (or another

Text Box 2
How Long Does the Agency Have to Implement the Training Requirements?

The training requirements will be phased in for EPA emergency responders who have not yet met the advanced radiation safety training requirement, and in those organizations where examinations have not previously been formally graded. All emergency responders will be expected, however, to meet all applicable training requirements no later than one year from the adoption of this Radiation Safety Program chapter.

designated person) must (1) provide the resources (including time and monetary support) needed to ensure successful completion of the training and (2) ensure that anyone who has NOT completed their training requirements is prevented from working in the field.

3.1.1 Basic and Advanced Radiation Safety Training Courses

Emergency responders must take basic radiation safety training (BRST) and advanced radiation safety training (ARST). Text Box 3 lists the topics that must be covered (at a minimum) in these courses.

The RSO or SHEMP Manager (or another designated person) must ensure that BRST is provided to each employee before, or at the time of, his or her enrollment into the personal monitoring program. The training requirement can be met either by: (1) requiring employees to complete EPA's BRST course (available on EPAs Online Training System) or (2) by offering organization-specific training.

For the ARST course, all emergency responders must complete it prior to (1) entering an emergency response situation in which ionizing radiation might be encountered or (2) managing a removal and remedial site where the potential for the presence of ionizing radiation exists. The RSO or SHEMP Manager (or another designated person) must offer an ARST course at least once per year or, as an alternative, must give the Removal Manager a list of courses that meet the ARST course requirements.

Emergency responders will be required to take BRST and ARST exams that have been developed and/or approved by their RSO or SHEMP Manager (or another designated person) to demonstrate their understanding of course material. The successful completion of an examination must be demonstrated by the student attaining a score of 80 percent or higher. If an employee fails to attain a score of 80 percent on either the BRST or ARST exam, the employee can still obtain a training certificate if he or she reviews the test questions with the RSO or SHEMP Manager (or another designated person) and verbally demonstrates an adequate understanding of the course material.

Text Box 3
BRST and ARST Requirements

BRST must cover:

- The nature of ionizing radiation.
- The biological effects of ionizing radiation.
- Protective measures that can be taken to minimize exposure to ionizing radiation.
- The contents of NRC Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure."
- The elements of EPA's radiation safety program.

ARST must cover:

- Procedures and techniques that have been established for using radiation detection equipment to conduct radiation surveys safely. ("Hands-on" familiarization with survey equipment and materials is included in the training.)
- Initial site surveys for radiation.
- Procedures for securing expert radiation safety or health physics assistance.
- Work practices and supervisory techniques that can be used to ensure employee exposure is as low as reasonably achievable.
- Procedures for allowing exposures that may exceed the Administrative Control Level of 500 mrem per year.

Emergency responders are allowed to take BRST and ARST courses from sources other than those provided by their direct managers. If this option is chosen, upon completion of the course, the employee must notify the RSO or SHEMP Manager (or another designated person), who will decide whether the course fulfills the necessary training requirements, and if so, administer an examination.

3.1.2 Refresher Courses

The RSO or SHEMP Manager (or another designated person) must periodically provide refresher radiation safety training for all emergency responders in the basic training category as well as those in the advanced radiation safety category. In accordance with SHEM Guideline 38, emergency responders must attend refresher training once every 2 years and attain a score of 80 percent or higher on associated examinations.

3.1.3 Other Training Requirements

The basic, advanced, and refresher training courses described above are called out as requirements in SHEM Guideline 38. EPA emergency responders must also receive training on how to use personal monitoring devices and radiation detection instrumentation. This training is discussed later in this chapter, under the following sections:

- TLD Badge Training—An Introduction to General TLD Guidelines (Section 4.2.1.1).
- Training on Radiation Detection Instrumentation (Section 5.1).

These training courses can (and often are) incorporated as specific modules in the BRST or ARST courses. Since the RSO or SHEMP Manager (or another designated person) is responsible for providing these additional training modules, it is left to his/her discretion whether to incorporate the TLD badge or radiation detection equipment modules into the BRST or ARST courses.

3.2 Training Records

When an employee completes a training course, the RSO or SHEMP Manager (or another designated person) must provide written documentation that the training has been completed and that the employee demonstrated adequate understanding of the material. (This information must also be documented in Field Readiness Module.) Some variation in documentation format is acceptable across EPA organizations. One possibility is to issue a training certification letter (see Appendix E for a template). Written documentation must be provided to the employee, Removal Manager, and HSPC. The Training Data Manager will maintain the training documentation for emergency responders in a permanent repository that is accessible to the Removal Manager, RSO, SHEMP Manager, HSPC, and emergency responders. However, each individual emergency responder will be responsible for: (1) maintaining certification that all of his or her training and medical monitoring is current and (2) ensuring that this documentation is available during response activities.

3.3 Training Waivers

In the event either the *National Response Framework (NRF)* or the *EPA Radiological Emergency Response Plan (EPA-RERP)* is activated, incident-specific special waivers of formal SHEM Guideline 38 training requirements may be granted.

For employees who have not yet completed BRST and ARST courses, emergency responders and the Removal Manager must contact the RSO or SHEMP Manager (or another designated person), who will in turn assess the employee's ability to perform the work and determine whether it is acceptable to issue a training waiver. If the RSO or SHEMP Manager (or another designated person) decides that a waiver is warranted, he or she will issue the waiver, provide the appropriate documentation (see Appendix F) to the Removal Manager and the employee, and maintain a record of the training waiver.

4.0 PERSONAL MONITORING

Personal monitoring programs are used to track and record occupational exposures to radiation. The goal of the programs is two-fold: (1) provide information about an individual's exposure profile and (2) limit his or her radiation exposure to EPA's radiation dose limits. This section describes the steps that must be taken to implement a personal monitoring program.

4.1 Enrollment in the Personal Monitoring Program

All EPA employees who are expected to perform emergency response activities must be enrolled in the personal monitoring program. Upon hiring new emergency responders, the Removal Manager must inform the RSO or SHEMP Manager (or another designated person), who will ask the employee to complete an enrollment form (see Appendix G for a sample), collect the completed form, maintain a list of employees enrolled in the personal monitoring program, distribute the list to the HSPC, and track enrollment information via Field Readiness Module.

At the time of enrollment, the RSO or SHEMP Manager (or another designated person) must ask the employee to provide prior employer information and to indicate whether previous employers collected radiation dosimetry data on him or her. If such data exist, the employee will be asked to sign a release for the previous exposure records. (A sample release form is provided in Appendix G.)

As part of enrollment, emergency responders are eligible for baseline bioassays. Bioassays are used to assess radioactive material present in the body. They may be required as a precautionary measure and when employees are exposed to loose radioactive material, or work in areas where radioactive material may be inhaled. On a site-specific basis, the RSO or SHEMP Manager (or another designated person) will develop a bioassay plan and determine which enrollees require initial baseline radionuclide-specific analysis. Any enrollee who receives a baseline radionuclide-specific analysis at any point during his or her participation in EPA's personal monitoring program may also receive a similar analysis upon exiting the program. The exit bioassay may include an assessment of any of the long-half-life radionuclides that an employee might have been exposed to, in addition to select radionuclides included in the initial or subsequent bioassays. The RSO or SHEMP Manager (or another designated person) must determine whether an exit bioassay is necessary on a site-specific basis.

4.2 External Exposure Monitoring—Requirements and Implementation Steps

4.2.1 Thermoluminescent Dosimeter (TLD) Program

The TLD badge is the standard device used for personal monitoring. The badge is used to measure whole-body radiation exposure and it can measure the shallow and penetrating components of ionizing radiation. The standard TLD issued to EPA employees, however, is limited to recording exposures resulting from gamma, x-ray, and some beta radiation. The badges do not provide real-time data on exposure levels. To determine how much radiation employees have been exposed to, employees must exchange their badges for new ones regularly and have their old badges analyzed. The readings from the exchanged badges are recorded and used to determine whether employees need to alter their activities to reduce radiation exposures.

4.2.1.1 TLD Badge Training

The RSO or SHEMP Manager (or another designated person) must provide training on TLD badges to emergency responders and will maintain a log documenting who has received this training. At a minimum, the training must cover the guidelines presented in Text Box 4.

4.2.1.2 Use, Exchange, and Storage Requirements for TLD Badges

If EPA issues a dosimeter to an employee, that employee is required to wear the dosimeter between the shoulders and the waist whenever he or she is working in an EPA work area that has a potential for radiation exposure that exceeds normal background levels. EPA-issued dosimeters must only be worn during EPA business. If another agency or organization has also issued a dosimeter to the employee, that dosimeter must be worn (as required) in addition to the EPA-issued dosimeter.

Unless otherwise specified (for example, see Section 4.2.5), TLDs will be exchanged (and their results reported) on a quarterly basis. The RSO or SHEMP Manager (or another designated person) does, however, have the authority to increase the frequency of the exchange if, for example, a particular site had areas that had the potential to cause elevated exposure levels.

When not in use, dosimeters must be stored to prevent damage and inadvertent exposure. The RSO or SHEMP Manager (or another designated person) and the HSPC must identify storage locations for badges that are not in use. EPA employees must place their TLDs in the designated storage location when not on work status.

Text Box 4
An Introduction to General TLD Guidelines

TLDs must be worn at all oil and hazardous waste sites and all sites where there is a potential for exposure to ionizing radiation.

TLDs must be worn outside personal protection clothing, between the neck and waist.

TLDs must be stored in a low-radiation area and in locations where the badges will not be exposed to elevated temperatures, light, or moisture.

TLDs must never be deliberately exposed to radiation or exposed to non-occupational sources of radiation. For example, TLDs must not be exposed to airport x-rays.

The RSO or SHEMP Manager (or another designated person) must be notified if (1) the TLD has been exposed to non-occupational sources of radiation, (2) the TLD has been lost or damaged, or (3) occupational exposure is suspected.

TLD badges must not be shared or worn by people to whom they have not been assigned.

The TLD must be returned at the end of the monitoring period to ensure prompt analysis.

4.2.1.3 Broken, Lost, or Contaminated TLDs

All TLD readings become a part of an employee's permanent dose record. It is important to make sure the TLDs are exchanged (and their results recorded) on a regular basis. EPA employees must notify the RSO or SHEMP Manager (or another designated person) immediately if their TLD badge has been exposed to non-occupational radiation sources, or if they suspect that the TLD has been lost, damaged, or compromised. Under such circumstances, the RSO or SHEMP Manager (or another designated person) must document the loss (or damage) and arrange for a replacement TLD to be issued. The RSO or SHEMP Manager (or another designated person) must also decide, based on a follow-up investigation, whether an exposure dose should be estimated and recorded for the time period for which the TLD badge was lost, damaged, or compromised. During the investigation, the RSO or SHEMP Manager (or another designated person) must gather the information necessary to determine or reconstruct any and all possible exposure scenarios. In some cases, the wearer might be assigned an exposure dose equal to EPA's maximum allowable radiation dose limits for the quarter. *(Note: At times the TLD vendor will automatically report EPA's maximum allowable radiation dose for any TLD that is not returned to them by the end of the designated monitoring period, as required by their procedures.)*

No assigned dose may be removed from the employee's dose record except at the discretion and approval of the RSO or SHEMP Manager (or another designated person).

4.2.2 Special Dosimeters

If EPA emergency responders are working at a site where radiation is a known hazard, they must report any potential or suspected exposure to the RSO or SHEMP Manager (or another designated person). At some work sites, additional special dosimeters might be required. For example, extremity TLD dosimeters (ring, wrist), neutron dosimeters, or alpha dosimeters might be deemed necessary. If this equipment is needed, the RSO or SHEMP Manager (or another designated person) must work with emergency responders and their supervisors to ensure that these exposure monitoring tools are available either through the RSO or SHEMP Manager (or another designated person) or through an outside vendor that has been contracted with the Superfund program.

4.2.3 Self-reading Dosimeter (SRD) Program

SRD devices provide real-time data on radiation exposure levels. There are two types of SRDs: electronic and passive. SRDs are used to (1) determine whether unanticipated radiological hazards are present, (2) assist in the completion of an exposure investigation, and (3) help ensure that EPA employees' exposure doses are as low as reasonably achievable (ALARA). In addition, SRDs can be used to corroborate legal TLD exposure records. The SRD Program must be administered as an extension of the TLD Program.

SRDs must be worn under the direction of the RSO or SHEMP Manager (or another designated person), who will distribute SRDs to emergency responders who have: (1) enrolled in the TLD program and (2) received a passing grade on the BRST exam.

Specific SRDs must be uniquely assigned to specific users. (This is to facilitate cross referencing and to verify exposure levels recorded by the specific users' TLD.) Distribution and assignment records must be maintained by the RSO or SHEMP Manager (or another designated person), and copies must be sent to the HSPC.

Employees will be provided an *Exposure Record Card* (see Appendix H for a sample card). The RSO or SHEMP Manager (or another designated person) must brief emergency responders on the Exposure Record Card and corresponding recordkeeping procedure. The Exposure Record Card records the serial number of the SRD, the beginning and end of shift dose values, and a calculated shift exposure. If the calculated shift dose is greater than 50 mrem (EPA's Action Reference Level), or if the whole body Hp(10) alarm sounds, the employee must notify the RSO, SHEMP Manager, Removal Manager, and/or supervisor (or another designated person). Exposure Record Cards must be turned into the RSO or SHEMP Manager (or another designated person) for review at the end of each incident response or at least quarterly.

Damaged SRDs must be turned in to the RSO or SHEMP Manager (or another designated person) for maintenance. The HSPC is responsible for routine cleaning and battery replacements. Maintenance records must be sent to and retained by the RSO or SHEMP Manager (or another designated person).

Electronic SRDs must be calibrated by the manufacturer on a staggered annual schedule. The RSO or SHEMP Manager (or another designated person) must collect and redistribute the SRDs and ensure that SRDs are zeroed or re-zeroed at the start of each incident.

SRD alarm thresholds must be determined by the RSO or SHEMP Manager (or another designated person) and may vary depending on the incident. For non-emergency conditions, SHEM Guideline 38

specifies a default whole body $H_p(10)$[1] dose alarm level of 50 mrem and a default whole body $H_p(10)$ dose rate alarm level of 25 mrem/hour. During a large-scale emergency, dose and dose rate alarms could be set at higher values such as 1,000 mrem and 1,500 mrem/hour, respectively. Any changes to the alarm levels must be approved by the RSO or SHEMP Manager (or another designated person).

4.2.4 Responding to the Dosimetry Data—Addressing Dose Limits

EPA has established the following internal thresholds to help the Agency determine when it is necessary to take action to protect its employees from exposures to ionizing radiation:

- *Action Reference Level (ARL)*. This value serves as a trigger level to ensure that an employee's radiation dose does not exceed EPA's annual dose limit. EPA has established an ARL of 50 mrem/quarter whole-body dose from external exposure or internal effective dose equivalent.

- *Administrative Control Level (ACL)*. This value represents EPA's annual radiation dose limit. It is the maximum acceptable dose for an individual EPA employee during a period of 12 consecutive calendar months. EPA has established an ACL of 500 mrem total effective dose equivalent (the sum of the doses for internal and external exposures). EPA's ACL is lower than the annual whole body dose limit of 5 rem (5,000 mrem) for adult workers specified by applicable occupational radiological protection standards such as OSHA's Ionizing Radiation standard (29 CFR 1910.1096) and the NRC Standards for Protection Against Radiation (10 CFR Part 20).

4.2.4.1 Exceeding the ARL

If an EPA employee's dosimeter returns a value greater than the ARL of 50 mrem/quarter, his or her exposure situation must be assessed. The dosimetry service provider must notify the RSO or SHEMP Manager (or another designated person) of the exceedance by issuing a "High Dose Report," who in turn must notify the employee and his or her Removal Manager. The RSO or SHEMP Manager (or another designated person), in collaboration with the employee, the employee's supervisor, the official in charge of the work area or site, and a health physicist, if needed, must perform a review of the circumstances that led to the ARL exceedance. No further action will be required if the employee and Removal Manager are satisfied that appropriate protective measures have been established to address the situation. If the source of the employee's exposure is unknown, however, the RSO or SHEMP Manager (or another designated person) must recommend performing additional exposure monitoring or modifying the employee's operating practices until the source is identified.

4.2.4.2 Exceeding the ACL

If an EPA employee's dosimeter returns a value greater than the ACL, then the quarterly and annual dose limits have been reached or exceeded and the employee's exposure situation must be assessed. The RSO or SHEMP Manager (or another designated person), in collaboration with the employee, the employee's supervisor, the official in charge of the work area or site, and a health physicist, if needed, must perform a review of the circumstances that led to the ACL exceedance. Any employee who reaches the ACL must be temporarily restricted from working on assignments that would expose him or her to additional radiation. (As noted below, this practice can be waived under special circumstances.) Managers and supervisors must not discriminate in employment practices—including hiring; discharge; compensation;

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[1] $H_p(10)$ is the personal dose equivalent (at a body depth of 10 millimeters) at the point of application of a personal dosimeter. It is an estimated value for the effective dose for whole body exposure.

and terms, conditions, or privileges of employment—if an employee incurs temporary work restrictions due to occupational radiation exposure equal to, or greater than, the ACL.

4.2.4.3 Special Circumstances—Planned Special Exposures and Emergency Operations

EPA's ACL of 500 mrem reflects EPA's commitment to the ALARA principle of restricting employee exposure to harmful radiation whenever possible. In certain cases, the RSO or SHEMP Manager (or another designated person) may allow an employee to temporarily receive more than his or her administrative dose limits. There are two scenarios in which elevated exposure levels are allowed:

- *Planned special exposures*. In some cases, an employee may ask for permission to exceed his or her ACL temporarily to complete a long-term project. Any request for planned special exposures must be submitted in writing to the RSO or SHEMP Manager (or another designated person) for approval. Approval of such requests must be granted before any planned special exposures are allowed to occur.
- *Emergency operations*. In certain emergency situations, such as activation of the NRF or EPA-RERP, EPA's Manual of Protective Action Guides and Protective Actions for Nuclear Incidents and DHS's draft Protective Action Guides for Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents provide emergency dose guidance for emergency responders. [2] These emergency guidelines are summarized in Table 1 and include 5 rem for basic response work activities, 10 rem for protecting major property, and 25 rem or more for lifesaving or protecting large populations. These guidelines apply to **doses incurred during an emergency** and represent dose constraint levels (i.e., when these dose levels are accumulated, the emergency responder must not take part in the later stages of the response that may significantly increase his or her dose). The RSO or SHEMP Manager (or another designated person) must discuss these dose limits with emergency responders well before any potential emergency operation, and again during an emergency, in order to properly inform employees of the health risks associated with the elevated exposure limits.

Employees who wish to participate in emergency operations where exposures may exceed 5 rem must meet the following criteria if at all possible: (1) informed volunteers who have been made fully aware of the short-term health effects that may occur from their exposures and the numerical estimates of the increase in their lifetime risk of cancer, (2) experienced in performing the required tasks (so that the time to accomplish the task will be less helping to minimize exposure), (3) older employees with low lifetime accumulated effective doses, (4) non-pregnant, and (5) over the age of 18. The total number of employees participating in these operations should be kept as low as necessary for the work to be completed.

The decision to employ the emergency guidelines and intentionally expose informed employees to radiation doses exceeding 5 rem must be justified by the senior EPA official on site (or another designated person) in collaboration with the RSO (or another designated person). Every reasonable effort must be made to control emergency exposures to ALARA levels for actions determined to be absolutely necessary for the protection of public and private welfare. The senior EPA official on site (or another designated person) must only make this decision after carefully considering the following: (1) is the action absolutely necessary, (2) is there a benefit and does the benefit outweigh the potential health risks to the emergency responders, (3) does the action have to be taken immediately or can it be delayed for

[2] All response activities must not exceed the ACL unless specifically designated as "emergency" operations by the senior EPA official on site (or another designated person) in collaboration with the RSO (or another designated person). For emergency operations, radiation exposure exceeding the ACL is restricted to the early and intermediate phases of the response only.

radiation doses to decrease or conditions to improve, (4) is every effort being made to control exposures to ALARA, and (5) what are the health risks to individual emergency responders.

In addition to the emergency dose limits in Table 1, emergency responders must consult EPA's Memorandum on *Turnback Guidance for EPA Personnel Responding to Radiological Emergencies* (see Appendix I). This guidance document supplements current radiation policies and guidance by providing exposure rates (commonly called "turnbacks") at which EPA emergency responders must turn back and seek further guidance before proceeding. The guidance is intended to be used in the early stages of an emergency when radiation health physics and health and safety assistance might not be readily available. EPA's turnback guidance provides alpha, beta, and gamma radiation turnback exposure rates, personal protective equipment (including respiratory protection) for alpha or beta emitters, "stay times" for various exposure rates, and possible health effects of very large radiation doses over short timeframes.

Note: Allowing "in the field" decisions regarding one's dose does not replace existing turnback procedures for notifying the RSO or SHEMP Manager (or another designated person). Rather, it is designed to augment these procedures in emergency situations. Emergency responders receiving any known or potential dose must alert the RSO or SHEMP Manager (or another designated person) *as soon after the incident as possible. When all emergency operations have been completed and recovery and cleanup have begun, all exposures during this non-emergency phase must be limited to EPA's ACL, and any departure from the ACL must be handled as a planned special exposure operation.*

Table 1
Radiation Exposure Limits for Early/Intermediate Phase Emergency Operations [a,b,c]

Dose Limit (Total Effective Dose Equivalent or TEDE [d])	Activity Performed	Conditions
5 rem	Basic response activities	All reasonably achievable actions have been taken to minimize dose.
10 rem [e]	Protecting valuable property necessary for public welfare (e.g., a power plant)	Only on a voluntary basis for personnel fully aware of the health risk involved. Exceeding 5 rem is unavoidable and all appropriate actions have been taken to reduce dose. Monitoring is available to project or measure dose.
25 rem [e,f]	Lifesaving or protecting large populations	Only on a voluntary basis for personnel fully aware of the health risk involved. Exceeding 5 rem is unavoidable and all appropriate actions have been taken to reduce dose. Monitoring is available to project or measure dose.
> 25 rem [e,g]	Lifesaving or protecting large populations	Only on a voluntary basis for personnel fully aware of the health risk involved. Exceeding 5 rem is unavoidable and all appropriate actions have been taken to reduce dose. Monitoring is available to project or measure dose.

Notes:

[a] These emergency guidelines apply to doses incurred over the duration of an emergency and represent dose constraints. When these dose levels are accumulated, emergency responders must not take part in the later stages of the response that may further increase their dose. Employees undertaking a response covered under these guidelines must do so with full awareness of the health risks involved, including knowledge of numerical estimates of the risk of delayed effects (such as cancer), and they must be given reasonable assurance that normal controls cannot be utilized to reduce doses below 5 rem.

[b] The dose limits to the lens of the eye are three times the listed values.

[c] The shallow dose limit to the skin of the whole body or to the skin of any extremity is 10 times the listed values.

[d] TEDE is the sum of the doses for internal and external exposures (i.e., the committed effective dose equivalent and the deep dose equivalent).

[e] Doses greater than 5 rem may require special follow-up medical monitoring programs.

Notes (continued):

[f] The 25 rem lifesaving guideline provides assurance that exposures will not result in detrimental short-term health effects such as acute radiation syndrome.

[g] In the case of a very large incident, the senior EPA official on site (or another designated person) in collaboration with the RSO (or another designated person) may need to consider raising the property and lifesaving guidelines in order to prevent further loss of life and massive spread of destruction. Such actions must only be taken with an understanding of the potential acute effects of radiation exposure to the emergency responders and based on the determination that the benefits of the action clearly exceed the associated risks.

Sources: (1) EPA 400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, May 1992; (2) DHS Draft Protective Action Guides for Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents, January 2006.

4.2.5 Monitoring Pregnant Employees and Addressing Concerns About the Embryo/Fetus

When a female employee declares that she is pregnant, special consideration must be given to protecting the embryo or fetus from radiation. During pregnancy, EPA must take measures to ensure that the occupational exposure dose to the embryo/fetus is kept ALARA. Special consideration for embryo or fetus protection must not create a basis for job discrimination and must be provided in conformance with the provisions of Title VII of the Civil Rights Act of 1964, as amended, regarding discrimination in employment practices, including hiring, discharge, compensation, and terms, conditions, or privileges of employment.

4.2.5.1 Counseling Female Employees About the Potential Effects of Prenatal Radiation Exposure

The RSO or SHEMP Manager (or another designated person) must counsel employees about the potential adverse health effects associated with prenatal radiation exposure. Female emergency responders must receive information about NRC Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure" during basic radiation safety training (see Text Box 3).

4.2.5.2 Declaring Pregnancy

It is the responsibility of the employee to decide whether she will declare her pregnancy to her employer. If she decides to do so, she is responsible for coordinating with the Removal Manager and the RSO or SHEMP Manager (or another designated person) to address safety issues and must submit a written declaration to the RSO or SHEMP Manager (or another designated person). A sample "Declaration of Pregnancy" memorandum is included in Appendix J. The employee must withdraw the declaration when she is no longer pregnant. If the declaration is not withdrawn, the written declaration will be considered expired one year after it was submitted.

4.2.5.3 Ensuring That Radiation Exposure to the Embryo/Fetus Is ALARA

The EPA ACL of 500 mrem during any period of 12 consecutive months for all employees provides an acceptable level of reproductive protection for parents and their embryo/fetus. The ACL is consistent with NRC regulations that require employers to ensure that the dose to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant employee, does not exceed 500 mrem.

NRC regulations also require that employers take appropriate measures to ensure a uniform monthly exposure rate to the pregnant employee.

Upon declaring pregnancy, the pregnant employee must continue to wear her whole-body TLD (normally worn on the front of the torso between the shoulders and the waist) and exchange that TLD on a monthly basis in accordance with SHEM Guideline 38. In addition, the RSO or SHEMP Manager (or another designated person) must provide an SRD to the pregnant employee, if she has already registered a partial ACL or is at risk for substantial exposure from unknown sources, when entering a radiation area. Monthly monitoring must remain in effect until the employee withdraws the declaration of her pregnancy in writing or if she is no longer pregnant. Monthly monitoring may also be provided to any requesting employee expressing reproductive concerns.

Since the embryo/fetus has lower dose limits, the pregnant employee must consult with the Removal Manager and the RSO or SHEMP Manager (or another designated person) to determine whether her job functions will be affected.

4.3 Internal Exposure Monitoring

Internal exposure to radiation can occur through inhalation, ingestion, or dermal exposure pathways. Internal monitoring methods, such as bioassay and whole-body counting, can be used to estimate and assess internal dose. In addition to collecting site- and event-specific information, internal monitoring can also be used to verify whether site engineering controls are adequate.

Any EPA employee who has a known exposure or who will be working in a known radiation environment (as determined by initial radiation detection survey or continuous area monitoring) must contact the RSO or SHEMP Manager (or another designated person) to develop a plan for any internal monitoring that might be necessary. The plan must include information on the type and frequency of internal monitoring that will be performed, as well as the dose assessment procedures (including any baseline and exit monitoring) that will be used. Monitoring results must be reported, upon receipt, to the EPA employee and included in his or her medical monitoring records.

4.4 Recordkeeping and Notification Requirements

The following describes the recordkeeping and notification requirements associated with EPA's personal monitoring program.

4.4.1 Dosimetry Records and Notification

The RSO or SHEMP Manager (or another designated person) receives quarterly dosimetry reports from the dosimetry service provider and retains copies of these reports. The RSO or SHEMP Manager (or another designated person) must ensure that these reports are available upon written request from an employee. Any report of exposures over the ARL or ACL must be reported immediately to the employee.

The dosimetry service provider must also provide a copy of all TLD reports to EPA's SSD Headquarters office. Every year, SSD must send the RSO or SHEMP Manager (or another designated person) an NRC Form 5 (Occupational Dose Record for a Monitoring Period) for each employee who has enrolled in the personal monitoring program. The RSO or SHEMP Manager (or another designated person) must distribute the annual occupational exposure records (NRC Form 5) to employees. The RSO or SHEMP Manager (or another designated person) must ensure that the employee's monitoring records become part of his or her employee medical monitoring information and that the records are treated as sensitive personal information.

Occupational exposure records must be protected from public disclosure because of the personal and private nature of the information contained in them. Therefore, any EPA employee who wishes to obtain information about TLD monitoring results from past years should contact the RSO or SHEMP Manager (or another designated person), who will contact SSD to request an NRC Form 4 (Cumulative Occupational Dose History). Records must not be released to anyone other than the employee without their expressed written consent.

5.0 USING AND MAINTAINING RADIATION DETECTION EQUIPMENT

5.1 Training on Radiation Detection Instrumentation

The HSPC and the RSO or SHEMP Manager (or another designated person) must ensure that emergency responders receive "hands-on" training on the proper use of radiation detection instrumentation (e.g., Geiger counters and scintillation detectors) and that a log is maintained documenting who has received this training. The training must also address the requirement to initially survey each field site as part of the site hazard evaluation to measure and evaluate radiation exposure dose rates and/or levels of contamination. The RSO or SHEMP Manager (or another designated person) is responsible for providing the training, whether by themselves or by using other resources, such as manufacturer representatives. Training on radiation detection equipment must be offered at least once every 2 years to ensure that all emergency responders attend the training and maintain a high level of proficiency with these instruments.

5.2 Tracking, Maintaining, and Calibrating Radiation Detection Equipment

The HSPC (or another designated person) must ensure that a list of radiation detection equipment that provides information on calibration and maintenance schedules is developed and maintained, that all radiation detection equipment is maintained and calibrated according to the schedule, and that all maintenance/calibration activities are documented and available for auditors and/or other stakeholders to review. The HSPC (or another designated person) must also ensure that standard operating procedures (SOPs) and calibration records are kept with the instruments.

6.0 USING EQUIPMENT THAT CONTAINS RADIOACTIVE SOURCES IN A SAFE MANNER

EPA employees might use equipment that contains licensed or exempt radioactive sources, such as gas chromatographs, x-ray fluorescent devices, and chemical agent monitors. In addition, radiation detection equipment (e.g., Geiger counters) often contains exempt quantities of radioactive materials in the form of check sources. While these sources are not governed by NRC licensing requirements, transportation of these check sources or other exempt quantities maybe accompanied by required paperwork. This section describes procedures for procuring, storing, securing, inventorying, testing, transporting, disposing of, and excessing equipment that contains radioactive sources. In addition, this section describes what must be done to ensure that NRC or agreement state licensing requirements for radioactive sources are met if applicable.

6.1 Meeting NRC License Requirements

EPA organizations must ensure that NRC license requirements (as applicable) are met. The possession and use of radioactive material may be regulated by the requirements of either a general or specific license. No person shall manufacture, produce, transfer, receive, acquire, own, possess, or use byproduct

material except as authorized in a specific or general license. (The only exceptions to this are devices that contain radioactive material below exempt quantities, as defined by the NRC.) Each organization must ensure that all license conditions and requirements, whether general or specific, are met. The RSO or SHEMP Manager (or another designated person) is responsible for meeting the necessary requirements of the NRC license for radioactive materials in equipment. As part of this effort, the RSO or SHEMP Manager (or another designated person) must coordinate any applicable NRC audits. The Removal Manager must work with those EPA staff that manage and use the equipment to ensure that it is stored, maintained, and transported properly.

6.2 Purchase, Storage, and Security

The RSO or SHEMP Manager (or another designated person) is responsible for the procurement of all equipment that contains licensed radioactive sources. He or she must ensure that all licensing and possession requirements are met and that any necessary license amendments are made. Procurement requests must include a disposal plan to ensure proper disposal of the device at the end of its life and to plan for the financial burden of disposal as agreed upon in the license.

Radioactive materials must be stored and secured in a manner that protects individuals from being exposed to and/or contaminated by the material. It is important to secure radioactive materials against theft. Several people, including emergency responders and the RSO or SHEMP Manager (or another designated person), must play a role in ensuring that equipment that contains radioactive sources is properly secured and stored. For example, the security of equipment that is stored in central EPA offices and locations will be the responsibility of the RSO or SHEMP Manager (or another designated person) and will be monitored by the RSO or SHEMP Manager (or another designated person). When the equipment is in the field, all site-specific requirements pertaining to the storage and security of this equipment are the responsibility of the RSO or SHEMP Manager (or another designated person) and must be communicated to the RSO or SHEMP Manager (or another designated person). If this equipment becomes damaged, lost, or stolen, the RSO or SHEMP Manager (or another designated person) must be notified.

6.3 Taking an Inventory

Each EPA organization must develop and maintain a list of the equipment that it owns or furnishes that contains licensed radioactive sources. The following, if applicable, must be recorded for each piece of equipment:

- Radionuclide(s)contained within the device;
- Radionuclide(s) activity;
- Radionuclide(s) assay date(s);
- Training and certification requirements;
- Maintenance and wipe sample records; and
- Guidelines and notification procedures for the transportation of the device in coordination with a certified Class 7 shipper.

The RSO or SHEMP Manager (or another designated person) must coordinate with the HSPC to maintain the list of equipment. On a semi-annual basis, the RSO or SHEMP Manager (or another designated person) must verify the accuracy of the inventory list.

6.4 Performing Leak Tests, Wipe Samples, and Maintenance Activities

Leak testing must be performed to satisfy licensing requirements, as applicable, and to ensure that there has been no breach in the integrity of the sealed source within the device. On a semi-annual basis (possibly in concurrence with the semi-annual inventory review described above), the RSO or SHEMP Manager (or another designated person) must perform and maintain records of the leak tests. Some manufacturers allow for longer intervals between leak testing, but any departures from the semi-annual timeframe must be at the discretion of the RSO or SHEMP Manager (or another designated person).

Maintenance and wipe sampling must be performed by the RSO or SHEMP Manager (or another designated person) in accordance with license requirements, as applicable, and the maintenance records must be recorded and stored by the Regional Readiness Center Staff. In addition, the Regional Readiness Center Staff must ensure that copies of the wipe sample records are located with the instrument. The Training Coordinator and Training Data Manager are responsible for (1) meeting training and certification requirements for the equipment and (2) maintaining documentation that these requirements have been met.

6.5 Shipping and Transporting Equipment That Contains Licensed Radioactive Sources

Regional Readiness Center Staff must develop guidelines for transportation and notification procedures to ensure that equipment that contains licensed radioactive sources is properly tracked during transport. Regional Readiness Center Staff must ensure that the guidelines are consistently followed.

Emergency responders must consult with the designated Class 7 certified Shipper and the RSO or SHEMP Manager (or another designated person) before attempting to transport materials and the designated Class 7 certified Shipper and the RSO or SHEMP Manager (or another designated person) must furnish the forms that are required to accompany the instrumentation. Shipping and transportation packages must accompany each device that contains radioactive materials. Each shipping and transportation package (obtained with the assistance of the designated Class 7 certified Shipper and the RSO or SHEMP Manager (or another designated person) must contain:

- A copy of the equipment instruction manual;
- A copy of the most recent leak test results, if applicable;
- A copy of the U.S. Department of Transportation (DOT)certification for equipment cases if applicable;
- A copy of emergency contact numbers and notification procedures;
- A copy of any reciprocity agreements from agreement states; and
- Any other appropriate DOT shipping papers.

6.5.1 Transporting NRC Exempt Sources

DOT exempt quantities of radioactive material represent a unique situation because they are not governed by NRC-licensing requirements. These exempt quantities are often used as check sources for radiation detection equipment or for training purposes. The transportation of exempt sources is the responsibility of the RSO or SHEMP Manager (or another designated person), who must ensure that exempt sources are accompanied by the required paperwork.

6.5.2 Inter-regional Transportation of Equipment

Inter-regional transportation of equipment must be coordinated by the RSO or SHEMP Manager (or another designated person), on a case-by-case basis.

6.6 Disposing of and Excessing Equipment

Each EPA organization must ensure that equipment containing radioactive sources is disposed of or excessed properly. If the equipment is licensed under a general or specific license, the equipment must be disposed or excessed as agreed upon in the license. No devices containing radioactive materials must be transferred to the General Services Administration. If a device is transferred, it must be transferred to a qualified licensed entity. Within Region 4, The Equipment Warehouse Managers are responsible for disposal or excessing of equipment that contains radioactive sources. Within the Removal Program, The Equipment Warehouse Manager is responsible for notifying and coordinating with the RSO or SHEMP Manager (or another designated person) when ready to dispose of or excess equipment.

7.0 RECORDKEEPING

Proper recordkeeping is an essential component of a radiation safety program to ensure that nationally consistent, readily accessible records are maintained. The recordkeeping requirements associated with different components of the radiation safety program have been discussed throughout this chapter. Table 2 provides a summary of these recordkeeping requirements.

Table 2
Records Associated with the Radiation Safety Program

Required Record	Details/Specified Forms	Completed/ Compiled By [a]	Retained/Maintained By [a]
Training certification for BRST, ARST, and refresher courses (Sections 3.1 and 3.2)	Letter (Appendix E)	• RSO or SHEMP Manager (or another designated person) • HSPC	• RSO or SHEMP Manager (or another designated person) • HSPC • Individual employees
	Field Readiness Module of the Emergency Management Portal	• RSO or SHEMP Manager (or another designated person) • HSPC	• RSO or SHEMP Manager (or another designated person) • HSPC
Training waivers (Section 3.3)	Letter (Appendix F)	RSO or SHEMP Manager (or another designated person)	• RSO or SHEMP Manager (or another designated person) • Individual employees
Records associated with TLD enrollment (Section 4.1)	TLD Enrollment Request (Appendix G)	• RSO or SHEMP Manager (or another designated person) • Individual employees	• RSO or SHEMP Manager (or another designated person) • HSPC
	Authorization for Release of Occupational Radiation Exposure Information (Appendix G)	• RSO or SHEMP Manager (or another designated person) • Individual employees	RSO or SHEMP Manager (or another designated person)

Required Record	Details/Specified Forms	Completed/ Compiled By [a]	Retained/Maintained By [a]
	List of employees enrolled in the personal monitoring program maintained in Field Readiness Module	RSO or SHEMP Manager (or another designated person)	• RSO or SHEMP Manager (or another designated person) • HSPC
Documentation associated with TLD badge training (Section 4.2.1.1)	Log documenting who has received training	RSO or SHEMP Manager (or another designated person)	• RSO or SHEMP Manager (or another designated person) • HSPC
Documentation of lost, damaged, or broken TLDs (Section 4.2.1.3)	Document the loss (or damage)	RSO or SHEMP Manager (or another designated person)	RSO or SHEMP Manager (or another designated person)
Records associated with SRDs (Section 4.2.3)	Logs documenting SRD distribution/assignments	RSO or SHEMP Manager (or another designated person)	• RSO or SHEMP Manager (or another designated person) • HSPC
	Exposure Record Cards (Appendix H)	Individual employees	RSO or SHEMP Manager (or another designated person)
	Maintenance records for SRDs	• RSO or SHEMP Manager (or another designated person) • HSPC	RSO or SHEMP Manager (or another designated person)
Records associated with planned special exposures (Section 4.2.4.3)	Requests for planned special exposures	Individual employees	RSO or SHEMP Manager (or another designated person)
	Approvals for planned special exposures	RSO or SHEMP Manager (or another designated person)	
Written declaration of pregnancy (Section 4.2.5.2)	Memorandum for Declaration of Pregnancy (Appendix J)	Individual employees	RSO or SHEMP Manager (or another designated person)
Dosimetry records (Section 4.4.1)	Quarterly Dosimetry Reports	Dosimetry service provider	• RSO or SHEMP Manager (or another designated person) • SSD
	NRC Form 5 (Occupational Dose Record for a Monitoring Period)	SSD	• RSO or SHEMP Manager (or another designated person) • SSD • Individual employees
	NRC Form 4 (Cumulative Occupational Dose History)	SSD	• RSO or SHEMP Manager (or another designated person) • SSD • Individual employees

Required Record	Details/Specified Forms	Completed/ Compiled By [a]	Retained/Maintained By [a]
Documentation associated with radiation detection instrumentation Sections 5.1 and 5.2)	Log documenting who has received training on the proper use of radiation detection instrumentation	• RSO or SHEMP Manager (or another designated person) • HSPC	• RSO or SHEMP Manager (or another designated person) • HSPC
	Inventory that lists radiation detection equipment and presents information on calibration and maintenance schedules	HSPC (or another designated person)	HSPC (or another designated person)
	Documentation of maintenance/calibration activities performed on radiation detection equipment		
Records associated with equipment that contains radioactive sources (Sections 6.3, 6.4, 6.5, and 6.5.1)	Inventory of equipment that contains radioactive sources	• RSO or SHEMP Manager (or another designated person) • HSPC	• RSO or SHEMP Manager (or another designated person) • HSPC
	Leak tests results	RSO or SHEMP Manager (or another designated person)	RSO or SHEMP Manager (or another designated person)
	Records documenting maintenance activities		
	Wipe sample records		
	Training/certification documentation for equipment containing radioactive sources	• RSO or SHEMP Manager (or another designated person) • HSPC • Training instructor	• RSO or SHEMP Manager (or another designated person) • HSPC • Training instructor
	Paperwork associated with the transport of exempt sources	RSO or SHEMP Manager (or another designated person)	• RSO or SHEMP Manager (or another designated person) • Accompanies the equipment
Radiation Safety Program Evaluation Form (Section 8)	Checklist (Radiation Safety Program Section of the Field Guide)	• SHEMP Manager • Removal Manager • HSPC	• SHEMP Manager • Removal Manager • HSPC

[a] The assignments in this table have been made with regional audiences in mind, and as a result, the positions listed might not be applicable to all organizations. Users can adjust the assignments when they go through the process of customizing Appendix A and filling information into the yellow-highlighted spaces that appear throughout this chapter.

8.0 PROGRAM EVALUATIONS

An evaluation of each organization's radiation safety program must be performed to ensure that it is being implemented properly and performing satisfactorily across the Agency.

8.1 Internal Evaluations

As noted in Section 5.4.1 of the manual's Introduction, EPA organizations must assess their health and safety programs at least annually. The purpose of the internal evaluation is to ensure that the organization's program is (1) being implemented in accordance with the minimum requirements identified in this chapter and (2) meeting its ultimate objective (i.e., minimizing the risk of injuries and illnesses that can result from radiation exposure). The Radiation Safety Program section of the Field Guide presents a checklist that can be used to assist in the evaluation process.

8.2 External Evaluations

Once a year, representatives from the Core ER Audit Team evaluate each EPA organization to examine the elements of the organization's emergency response program, including health and safety, to ensure that the program is being implemented in a consistent fashion across the Agency. EPA organizations must provide the CORE ER Audit Team members with the information they require to complete their evaluation.

8.3 Field Audits

Field audits must be performed to ensure that the Agency's health and safety programs are being implemented in the field. Care must be taken during these audits to ensure that issues related to radiation safety are addressed if such issues are relevant for a particular site. Section 5.4.2 of the manual's Introduction provides additional information on the field audits, including the individuals who will be responsible for performing them and how many must be completed each year.

APPENDIX A

Radiation Safety Program: Designation of Roles and Responsibilities

Instructions for Users

Appendix A provides a place for users to insert organization-specific information into the Radiation Safety Program chapter. Appendix A presents a list of tasks that must be performed to ensure the smooth operation of a radiation safety program. The tasks are listed in rows. EPA position titles (e.g., the Removal Manager or the Health and Safety Program Contact) are listed in columns. Each task has been assigned to a default position. For some of the tasks, check marks have been placed in two or more columns to indicate that more than one person assumes responsibility for that task. **Please note that users can re-delegate tasks**.

Users must take the following steps to customize Appendix A:

- Fill in the background information requested at the top of page A-3. For example, indicate when the table is being updated and who is doing the updating.
- Fill in actual names under the position titles.
- Add columns to include additional key players (if necessary).
- Add rows to the end of the table (if necessary) to provide information about activities that exceed the minimum requirements already included in Appendix A. (See Appendix B for a list of your organization's additional policies and procedures related to radiation safety.)
- Determine whether any of the recommended task assignments must be delegated to another person. (If so, move the check marks to re-assign the task.)
- Ensure that each task has been assigned to a specific person.

ATTENTION ERT, CMAT, and HQ Users: The tasks in Appendix A have been written with regional audiences in mind. ERT, CMAT, and HQ users should modify the language that appears in the rows and the column headers to reflect the needs of their organization.

APPENDIX A
Task Chart for Implementing the Radiation Safety Program Chapter

This table has been customized for: EPA Organization.
Last updated on: March 3, 2017.
Updated by Kevin Eichinger.

	Who Is Responsible for Each Task or Action?								
TASKS ▼ **ROLES ►**	**Removal Manager**	**SHEMP Manager**	**RSO**	**HSPC**	**Onsite Safety Officer**	**Emergency Responders**	**Supervisors**	**Senior EPA Official at Response Site**	**Other**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
General Tasks									
1. Implement the Radiation Safety Program chapter, a process which involves: (1) customizing the chapter with organization-specific information, (2) reviewing/updating the customized version annually, and (3) adopting the requirements and practices presented in the chapter. Post the customized chapter to the manual's Web site and inform stakeholders of its availability.	✓	✓	✓	✓					
2. Ensure that the procedures outlined in the Radiation Safety Program chapter are being followed by all responsible parties. Support radiation safety related programs established by the SHEMP Manager and RSO. Authorize the use of funds and human resources to implement and support the radiation safety program.	✓								
3. Develop and operate a radiation safety program that ensures compliance with all NRC or applicable agreement state radioactive license conditions.		✓	✓						
4. Serve as the organization's contact on radiation safety issues for emergency responders. (Facilitate and coordinate communication between the managers who administer the radiation safety program and the emergency responders who are subjected to the program.)				✓					
5. Ensure the safety of all onsite personnel working in the field.			✓		✓	✓	✓	✓	
Tasks Associated with Radiation Safety Training (Section 3.0)									
6. Prevent employees from working in the field if they have not met their radiation safety training requirements. Allot time and travel money for emergency responders to take radiation safety courses.	✓				✓				

	Who Is Responsible for Each Task or Action?								
TASKS ▼ **ROLES ►**	**Removal Manager**	**SHEMP Manager**	**RSO**	**HSPC**	**Onsite Safety Officer**	**Emergency Responders**	**Supervisors**	**Senior EPA Official at Response Site**	**Other**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
7. Develop, organize, and coordinate a radiation safety training program and make sure training is available to all emergency responders.		✓	✓	✓					
8. Ensure that all incoming emergency responders receive a basic radiation safety training (BRST) course.		✓	✓	✓					
9. Offer an advanced radiation safety training (ARST) course at least once a year or, as an alternative, provide a list of courses that meet ARST requirements that emergency responders can attend.		✓	✓	✓					
10. If an employee takes a BRST or ARST course from an outside source, determine whether the training meets EPA's requirements.		✓	✓	✓					
11. Develop, administer, and grade a BRST exam and an ARST exam (or identify existing exams) to determine whether emergency responders have absorbed the concepts presented in the training courses. Work with those who do not achieve a score of at least 80 percent to make sure they receive the support they require to obtain a thorough understanding of the training materials.		✓	✓	✓					
12. Provide refresher radiation safety training courses on a regular basis and administer an exam to determine whether trainees have absorbed the material presented in the refresher course.		✓	✓	✓					
13. Determine whether the following training modules should be incorporated into the BRST or ARST courses: (1) TLD guidance and (2) the proper use of radiation detection equipment. (As an alternative, these modules can be taught as standalone courses.)		✓	✓	✓					
14. Attend a BRST course and achieve a score of at least 80 percent on the associated exam.						✓			
15. Attend an ARST course and achieve a score of at least 80 percent on the associated exam.						✓			
16. Attend radiation safety refresher courses at least once every 2 years, and achieve at least 80 percent on the associated exam.						✓			

TASKS ▼ / ROLES ►	Who Is Responsible for Each Task or Action?								
	Removal Manager	SHEMP Manager	RSO	HSPC	Onsite Safety Officer	Emergency Responders	Supervisors	Senior EPA Official at Response Site	Other
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
17. Working with your Removal Manager, submit a training waiver request to the RSO or SHEMP Manager (or another designated person) if the following situation applies: (1) an emergency response situation occurs before you have had a chance to complete your formal training requirements and (2) you feel confident that you possess a thorough understanding of radiation safety considerations even in the absence of formal training.						✓			
18. Assess whether it is appropriate to issue a training waiver to specific employees if an emergency situation arises and an employee has not yet completed his or her training requirements.		✓	✓	✓					
Tasks Associated with the Personal Monitoring Program (Section 4.0)									
19. Notify the RSO or SHEMP Manager (or another designated person) when new emergency responders are hired. Follow up to ensure that new hires are enrolled in EPA's personal monitoring program.	✓								
20. Enroll new emergency responders into the personal monitoring program by doing the following: • Ask employees to fill out enrollment forms (Appendix G) and collect the completed forms. • Ask employees to provide prior employer information and to indicate whether previous employers collected radiation dosimetry data. If such data exist, ask employees to sign a release (Appendix G) for their previous exposure records. • Determine whether enrollees require radionuclide-specific baseline bioassays.		✓	✓	✓					
21. Enroll in EPA's personal monitoring program.						✓			
22. If necessary, schedule a radionuclide-specific bioassay when an employee leaves EPA. *(Note: Exit bioassays are only required if an employee received a baseline radionuclide-specific bioassay at any point during his or her participation in EPA's personal monitoring program.)*		✓	✓						
23. Provide training on TLD badges to emergency responders.		✓	✓	✓					
24. Obtain training on how to use TLD badges.						✓			
25. Wear TLD badges at sites where there is a potential for exposure to ionizing radiation.						✓			

	Who Is Responsible for Each Task or Action?								
TASKS ▼ **ROLES ►**	**Removal Manager**	**SHEMP Manager**	**RSO**	**HSPC**	**Onsite Safety Officer**	**Emergency Responders**	**Supervisors**	**Senior EPA Official at Response Site**	**Other**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
26. Determine if the TLD default exchange schedule (i.e., exchanging TLD badges on a quarterly basis) is acceptable, or whether it is necessary to increase the frequency of exchange for work that is being performed at a particular site.		✓	✓	✓					
27. Unless otherwise specified, exchange TLD badges on a quarterly basis.						✓			
28. Identify locations where TLD badges can be stored.				✓					
29. Place TLDs in designated storage locations at the end of your shift.						✓			
30. Issue replacement badges if a TLD is lost or damaged and decide (based on a follow-up investigation) whether to estimate and record an exposure dose for the time period for which the TLD badge was lost, damaged, or compromised.		✓	✓	✓					
31. Notify the RSO or SHEMP Manager (or another designated person) immediately if your TLD has been exposed to non-occupational radiation sources or if you suspect that the TLD has been lost, damaged, or compromised.						✓			
32. If a request is made to remove an assigned dose from an employee's official exposure record, determine whether the request should be granted.		✓	✓	✓					
33. Determine whether it is necessary to issue special dosimeters (e.g., extremity TLD dosimeters, neutron dosimeters, or alpha dosimeters) to emergency responders working at a particular site. If so, ensure that these special dosimeters are made available.		✓	✓	✓					
34. Wear special dosimeters, such as extremity TLDs, neutron dosimeters, or alpha dosimeters, if the RSO or SHEMP Manager (or another designated person) has instructed you to do so.						✓			
35. Distribute SRD devices and *Exposure Record Cards* to emergency responders who have: (1) enrolled in the TLD program and (2) received a passing grade on the BRST exam.		✓	✓	✓					
36. Provide information to emergency responders on how to use their SRDs and how to fill out *Exposure Record Cards*.		✓	✓	✓					
37. Wear SRD devices at sites where there is a potential for exposure to ionizing radiation.						✓			

	Who Is Responsible for Each Task or Action?								
TASKS ▼ **ROLES ►**	**Removal Manager**	**SHEMP Manager**	**RSO**	**HSPC**	**Onsite Safety Officer**	**Emergency Responders**	**Supervisors**	**Senior EPA Official at Response Site**	**Other**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
38. Notify the RSO or SHEMP Manager (or another designated person) immediately if: • Your whole body $H_p(10)$ alarm sounds or if radiation detection levels are detected at 1 mrem/hour. • You have reached a one-time shift dose limit of 50 mrem, or • You have reached a dose limit of 50 mrem over several shifts.						✓			
39. Collect damaged SRDs that have been turned in.		✓	✓	✓					
40. Turn damaged SRDs into the RSO or SHEMP Manager (or another designated person) for maintenance.						✓			
41. Collect and redistribute SRDs and ensure that the SRDs are zeroed or re-zeroed at the start of each incident.		✓	✓	✓					
42. Set dose alarms for SRDs and determine whether it is necessary to deviate from the alarm settings proposed in Section 4.2.3.		✓	✓	✓					
43. Perform routine cleaning and battery replacements on SRD devices and send records of maintenance activities to the RSO or SHEMP Manager (or another designated person).		✓	✓	✓					
44. Serve as a contact person for dosimetry service providers. Collect quarterly dosimetry reports from the dosimetry service providers. Ensure the reports are available to employees upon written request. If a TLD badge records a dose that exceeds the Agency's Action Reference Level (ARL) of 50 mrem/quarter or the Administrative Control Level (ACL) of 500 mrem/year, immediately notify the affected employee and his/her Removal Manager about the exceedance.		✓	✓	✓					
45. Notify your direct supervisor and the RSO OR SHEMP Manager or other designated person if you know (or suspect) that you have been exposed to radiation.						✓			

TASKS ▼ / ROLES ►	Who Is Responsible for Each Task or Action?								
	Removal Manager	**SHEMP Manager**	**RSO**	**HSPC**	**Onsite Safety Officer**	**Emergency Responders**	**Supervisors**	**Senior EPA Official at Response Site**	**Other**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
46. If an employee has been exposed to radiation doses in excess of the Agency's ARL or ACL, collaborate with the employee to review the circumstances that led to the exceedance and consider the following: • Recommend additional exposure monitoring to identify the radiation source. • Modify the employee's practices until the source of radiation is identified and proper protective measures are instituted. • Prevent the employee from working on assignments that would expose him/her to additional radiation for the rest of the year.	✓	✓	✓				✓	✓	
47. Communicate with your Removal Manager and the RSO or SHEMP Manager (or another designated person) about modifying your duties or implementing protective measures if dosimetry data indicate that you have exceeded the Agency's ARL (i.e., 50 mrem per quarter) or ACL (i.e., 500 mrem per year).						✓			
48. Evaluate requests for planned special exposures to determine whether an employee will be allowed to temporarily exceed EPA's ACL of 500 mrem/year. Counsel employees who might encounter elevated exposure levels during emergency operation scenarios.		✓	✓						
49. Inform employees that exposure levels exceeding 5 rem are allowed during emergency operations. Inform employees of the health risks associated with the elevated exposure levels well in advance of an emergency situation, and again during the emergency.		✓	✓						

	Who Is Responsible for Each Task or Action?								
TASKS ▼ ROLES ►	Removal Manager	SHEMP Manager	RSO	HSPC	Onsite Safety Officer	Emergency Responders	Supervisors	Senior EPA Official at Response Site	Other
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
50. Obtain information about planned special exposures and emergency operations and the required procedures (such as formal requests to temporarily exceed the ACL). Consult with the senior EPA official on site (or another designated person) and the RSO or SHEMP Manager (or another designated person) before entering an environment where you could be exposed to doses greater than the Agency's ACL of 500 mrem. If the nature of the emergency makes it impossible to receive pre-approval, contact the RSO or SHEMP Manager (or another designated person) to notify him or her of what you have been exposed to as soon after the incident as possible.						✓			
51. Determine when response activities will be designated as emergency activities and ensure that all response activities do not exceed the ACL unless specifically designated as emergency activities.			✓					✓	
52. Justify the decision to employ the emergency exposure guidelines only after carefully considering (1) the necessity of the action, (2) whether the benefit to society is commensurate with the risks from the emergency actions, (3) response options, (4) radiation dose, and (5) health risks to emergency responders.			✓					✓	
53. If you are pregnant, decide whether you want to declare your pregnancy to your employer. If so, declare your pregnancy in writing and coordinate with your Removal Manager and the RSO or SHEMP Manager (or another designated person) to: (1) discuss extra precautionary measures that should be taken to protect the embryo/fetus and (2) determine whether it is necessary to modify your job functions during your pregnancy.						✓			
54. Counsel employees about the potential adverse health effects associated with prenatal radiation exposure. Inform female emergency responders about the contents of NRC Guide 8.13 (Instruction Concerning Prenatal Radiation Exposure) during basic radiation safety training.		✓	✓	✓					
55. Instruct employees who have declared pregnancy that their badge is subject to lower administrative dose limits and must be exchanged on a monthly basis.		✓	✓	✓					

	Who Is Responsible for Each Task or Action?								
TASKS ▼ ROLES ►	Removal Manager	SHEMP Manager	RSO	HSPC	Onsite Safety Officer	Emergency Responders	Supervisors	Senior EPA Official at Response Site	Other
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
56. Talk to pregnant employees about: (1) extra precautionary measures that must be taken to protect the embryo/fetus and (2) whether it is necessary to modify their job functions during their pregnancy.	✓	✓	✓	✓					
57. If necessary, assist emergency responders in developing an internal monitoring plan.		✓	✓	✓					
58. Communicate with the RSO or SHEMP Manager (or another designated person) about whether it is necessary to develop an internal monitoring plan.						✓			
Tasks Associated with Using and Maintaining Radiation Detection Equipment (Section 5.0)									
59. Assume overall responsibility for ensuring that your organization's radiation detection equipment is maintained at a high level of readiness.	✓								
60. Ensure that emergency responders receive "hands-on" training on the proper use of radiation detection equipment at least once every 2 years and that they survey each field site initially for radiation.		✓	✓	✓	✓				
61. Attend training sessions that provide information on the proper use of radiation detection equipment and conduct an initial survey of each field site for radiation.						✓			
62. Ensure that your organization's radiation detection equipment is maintained and calibrated.		✓	✓	✓					
Tasks Associated with Using Equipment that Contains Radioactive Sources in a Safe Manner (Section 6.0)									
63. When in the field, take responsibility for the storage and security of equipment that contains radioactive sources. Communicate all site-specific storage and security requirements to the RSO or SHEMP Manager (or another designated person).						✓			
64. Notify Equipment Warehouse Manager immediately if any equipment containing radioactive sources becomes damaged, lost, or stolen while working in the field.						✓			
65. Check in regularly with those who manage and use equipment that contains radioactive sources to ensure that the equipment is stored, maintained, and transported properly.	✓	✓	✓	✓					
66. Meet the necessary requirements of the NRC license for radioactive materials in equipment.		✓	✓						

	Who Is Responsible for Each Task or Action?								
TASKS ▼ **ROLES ►**	**Removal Manager**	**SHEMP Manager**	**RSO**	**HSPC**	**Onsite Safety Officer**	**Emergency Responders**	**Supervisors**	**Senior EPA Official at Response Site**	**Other**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
67. Coordinate any applicable NRC inspections.		✓	✓						
68. Procure equipment that contains licensed radioactive sources. (Ensure that licensing and possession requirements are met, license amendments are made, and procurement requests include a disposal plan.)		✓	✓						
69. Take responsibility for the security of equipment that contains radioactive sources when it is being stored in central EPA offices and locations.		✓	✓						
70. Perform leak tests (on a semi-annual basis) on equipment that contains radioactive materials. *[Note: Some manufacturers allow for longer intervals between leak testing, but any departures from the semi-annual timeframe must be at the discretion of the RSO or SHEMP Manager (or another designated person)].*		✓	✓						
71. Perform maintenance and wipe sampling on equipment that contains radioactive materials in accordance with license requirements.		✓	✓	✓					
72. Ensure that all training and certification requirements are met for equipment that contains radioactive materials.		✓	✓	✓					
73. Develop guidelines for transportation and notification procedures to ensure that equipment that contains licensed radioactive sources is properly tracked during transport.		✓	✓						
74. Coordinate inter-regional transportation of equipment that contains radioactive sources.		✓	✓						
75. Consult the RSO or SHEMP Manager (or another designated person) to find out what paperwork and packaging is needed before attempting to transport equipment that contains radioactive materials.						✓			
76. Ensure that equipment that contains radioactive sources is disposed of or excessed properly.		✓	✓						
77. Within the Removal Program, assume responsibility for notifying and coordinating with the RSO or SHEMP Manager (or another designated person) when ready to dispose of or excess equipment.		✓	✓						

	Who Is Responsible for Each Task or Action?								
TASKS ▼ **ROLES ►**	**Removal Manager**	**SHEMP Manager**	**RSO**	**HSPC**	**Onsite Safety Officer**	**Emergency Responders**	**Supervisors**	**Senior EPA Official at Response Site**	**Other**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
Tasks Associated with Recordkeeping (Section 7.0)									
78. Ensure that recordkeeping procedures outlined in the organization's Radiation Safety Program are followed.		✓	✓	✓	✓				
79. Document the fulfillment of training requirements. For example, issue letters (Appendix E) to employees who have completed a training course and provide copies of the letter to the employee, Removal Manager, and HSPC.		✓	✓	✓					
80. Maintain copies of training certificates and keep them in an accessible location so that they can be carried into the field during assignment.						✓			
81. Ensure that training requirements are tracked using Field Readiness Module (see Section 5.3 of the manual's Introduction for procedures) and that the Removal Manager is aware of which employees have (and which have not) completed their training requirements.		✓	✓	✓					
82. Issue Training Waiver Letters (Appendix F) when appropriate during an emergency situation and maintain records of the waivers.		✓	✓			✓			
83. Maintain a list of the employees who are enrolled in the personal monitoring program including copies of completed enrollment forms and releases for previous exposure records.		✓	✓	✓					
84. Submit a formal request in writing to the RSO or SHEMP Manager (or another designated person) to temporarily exceed the ACL to complete a long-term project (i.e., planned special exposure).						✓			
85. Maintain a log documenting who has received training on TLD badges.		✓	✓	✓					
86. Document the loss or damage of a TLD.		✓	✓						
87. Fill out SRD *Exposure Record Cards* at the beginning and end of each shift and submit the cards to the RSO or SHEMP Manager (or another designated person) at the end of each incident response, or at least quarterly.						✓			
88. Maintain copies of SRD distribution and assignment records.		✓	✓	✓					
89. Maintain SRD maintenance records.		✓	✓	✓					

	Who Is Responsible for Each Task or Action?								
TASKS ▼ **ROLES ►**	**Removal Manager**	**SHEMP Manager**	**RSO**	**HSPC**	**Onsite Safety Officer**	**Emergency Responders**	**Supervisors**	**Senior EPA Official at Response Site**	**Other**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
90. Keep copies of any site-specific dosimetry reports that are generated when using special dosimeters and submit these reports to the RSO or SHEMP Manager (or another designated person).						✓			
91. Retain copies of quarterly dosimetry reports.		✓	✓	✓					
92. Obtain an NRC Form 5 (Occupational Dose Record for a Monitoring Period) for each employee enrolled in the Personal Monitoring Program and distribute the forms to employees. *(Note: These reports will be provided by Headquarters' SSD office.)*		✓	✓	✓					
93. Ensure that employees' radiation exposure monitoring records become part of their medical monitoring file and ensure that the records are treated as sensitive personal information.		✓	✓	✓					
94. Collect all site-specific dosimetry reports (e.g., *Exposure Record Cards* and any reports generated from special dosimeters, such as alpha dosimeters) at the end of each incident response, or at least quarterly.		✓	✓	✓					
95. Submit a written declaration to the RSO or SHEMP Manager (or another designated person) if you are pregnant and decide to declare your pregnancy to your employer (see Appendix J).						✓			
96. Maintain records documenting who has received "hands-on" training on the proper use of radiation detection equipment.		✓	✓	✓					
97. Develop a list of your organization's radiation detection equipment. Make sure the list stays current.		✓	✓	✓					
98. Make sure that all radiation detection equipment maintenance and calibration activities are documented and that documentation is readily available for auditors and other stakeholders to review.		✓	✓	✓					
99. Develop and maintain a list of the equipment that your organization owns or furnishes that contains licensed radioactive sources. Verify the accuracy of the inventory list on a semi-annual basis.		✓	✓	✓					
100. Ensure that records of leak tests on equipment that contains radioactive materials are maintained.		✓	✓	✓					
101. Retain records that document maintenance activities performed on equipment that contains radioactive materials.		✓	✓	✓					

	Who Is Responsible for Each Task or Action?								
TASKS ▼ ROLES ►	Removal Manager	SHEMP Manager	RSO	HSPC	Onsite Safety Officer	Emergency Responders	Supervisors	Senior EPA Official at Response Site	Other
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.								
102. Ensure that copies of wipe sample records are located with all pieces of equipment that contain radioactive materials.		✓	✓	✓					
103. Ensure that appropriate documentation is obtained to verify that all training and certification requirements are met for equipment that contains radioactive materials.		✓	✓	✓					
104. Furnish the forms that are required to accompany the transport of equipment that contains radioactive sources.		✓	✓						
105. Ensure that exempt sources are accompanied by the appropriate transport paperwork.		✓	✓						
106. Retain completed *Radiation Safety Program Evaluation Forms*.	✓	✓		✓					
Tasks Associated with Program Evaluations and Field Audits (Section 8.0)									
107. Perform internal program evaluations to determine whether your organization's radiation safety program is being implemented in accordance with the minimum requirements that are outlined in this chapter. As part of that effort, fill out the evaluation form (Radiation Safety Program section of the Field Guide).	✓	✓	✓	✓					
108. Take steps to correct any deficiencies that are identified during internal evaluations. If necessary, alert senior managers that a problem exists and that their assistance is required to resolve the problem.	✓	✓	✓						
109. Upon request, provide information about the organization's radiation safety program to Core ER Audit Team members.	✓	✓	✓	✓		✓			
110. If applicable, ensure that radiation safety is incorporated into the organization's HASPs.	✓	✓		✓		✓			
111. When field audits are performed, ensure that radiation safety issues are addressed if such issues are relevant at a particular site.		✓	✓	✓	✓		✓	✓	
Additional Tasks that Reflect Organization-Specific Procedures (Appendix B)									
Attention: Add additional rows and columns if necessary.									

APPENDIX B

Radiation Safety Program: Documentation of Additional Policies and Procedures

The procedures and tasks outlined in the Radiation Safety Program chapter represent the **minimum requirements** that each EPA organization must meet to minimize the risk of being exposed to (and potentially experiencing adverse effects from) ionizing radiation. If users advocate the use of additional policies and procedures, they must also:

- Add information about additional tasks in the rows that appear at the end of Appendix A and ensure that each task is assigned to a specific individual; and
- Ensure that the additional policies and procedures are mentioned in the main text of the Radiation Safety Program chapter. This can be accomplished by either (1) inserting the additional policies and procedures directly into the relevant portions of the main body of the chapter or (2) adding a sentence within the main text that directs readers to Appendix B for more information.

Topic	Please document the additional policies and procedures required for Organization Name here.
Section 3.1 Training Requirements	See R4 ERRB Standard Operating Guidelines at https://response.epa.gov/hsmanualregion4 1. SOG D102: Radiation Personnel Decontamination 2. SOG T113: XRF Analyzer Safe Use Guidelines
Section 3.2 Training Records	
Section 3.3 Training Waivers	
Section 4.1 Enrollment in the Personal Monitoring Program	
Section 4.2.1 TLD Program	
Section 4.2.2 Special Dosimeters	
Section 4.2.3 SRD Program	
Section 4.2.4 Responding to the Dosimetry Data – Addressing Dose Limits	
Section 4.2.5 Monitoring Pregnant Employees and Addressing Concerns About the Embryo/Fetus	
Section 4.3 Internal Exposure Monitoring	
Section 4.4.1 Dosimetry Records and Notification	
Section 5.1 Training on Radiation Detection Instrumentation	
Section 5.2 Tracking, Maintaining, and Calibrating Radiation Detection Equipment	
Section 6.1 Meeting NRC License Requirements	

Topic	Please document the additional policies and procedures required for Organization Name here.
Section 6.2 Purchase, Storage, and Security of Equipment with Radiation Sources	
Section 6.3 Taking an Inventory of Equipment with Radiation Sources	
Section 6.4 Performing Leak Tests, Wipe Samples, and Maintenance Activities of Equipment with Radiation Sources	
Section 6.5 Shipping and Transporting Equipment That Contains Licensed Radioactive Sources	
Section 6.6 Disposing of and Excessing Equipment That Contains Radioactive Sources	
Section 7.0 Recordkeeping	
Section 8.0 Program Evaluations	
Other topics	

APPENDIX C

Glossary

GLOSSARY

Action Reference Level (ARL)
A quantitative level of an individual's occupational exposure to ionizing radiation at or above which a review by management is conducted. A dose equivalent level of 50 mrem (0.50 milliSievert) per quarter whole-body dose from external exposure or internal effective dose equivalent has been established as the ARL under EPA's SHEM Guideline 38, Radiation Safety and Health Protection Program.

Administrative Control Level (ACL)
The maximum dose permitted under EPA's Radiation Safety and Health Protection Program during a period of any 12 consecutive calendar months. EPA has established a dose limit of 500 mrem (5.0 milliSievert), total effective dose equivalent from internal (committed effective dose equivalent) plus external whole body dose.

Agreement state
A state that has signed an agreement with the Nuclear Regulatory Commission under which the state regulates the use of byproduct, source, and small quantities of special nuclear material within that state.

As low as reasonably achievable (ALARA)
An approach to radiological protection to control or manage exposures (both individual and collective to the work force and general public) to as low as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit, but a process whose objective is to achieve dose levels as far below applicable limits as reasonably achievable.

Byproduct material
Byproduct materials are (i) any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using special nuclear material (as in a reactor); and (ii) the tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by these solution extraction operations do not constitute "byproduct material" within this definition.

Check source
A radioactive source (containing a known quantity of radioactive material) that is specifically manufactured, obtained, or retained for the purpose of utilizing the emitted radiation. Check sources are used to characterize the response of a radiation monitoring instrument in the presence of radioactivity. They are usually stand-alone sealed sources (encased in metal or plastic) used to calibrate or check the performance of instrumentation. (Some analytical equipment such as gas chromatographs and liquid scintillation counters contain sealed sources.) Check sources may be subject to periodic inventory and source integrity tests (e.g., every 6 months).

Committed dose equivalent
The total amount of dose equivalent projected to be absorbed by an individual over a 50-year period after intake of a radionuclide.

Committed effective dose equivalent
The total amount of effective dose equivalent projected to be absorbed by the whole body over a 50-year period after a radionuclide is taken into the body, taking into account organ specific weighting factor(s). It does not include contributions from external dose.

Dose
A general term denoting the quantity of radiation or energy absorbed. For special purposes, it must be appropriately qualified. If unqualified, it refers to absorbed dose.

Dose equivalent (H)
The amount of dose absorbed in tissue that considers the different biological effects of different types of radiation (i.e., x-ray, alpha, neutrons). It is the product of absorbed dose in tissue (D), a radiation specific quality factor (Q), and any other modifying factors (N), where H=DQN. The dose equivalent has the unit term "rem" or "Sievert." $H_p(10)$ is the personal dose equivalent (also known as the deep dose equivalent). It is the dose equivalent in tissue at a depth of 10 mm in the body at the location where the personal dosimeter is worn.

Effective dose equivalent
The amount of dose equivalent received that considers the differing sensitivities of various tissues to the effects of radiation exposure. It is the sum of the product of the dose equivalent and a tissue specific weighting factor.

Exempt radioactive source
Products containing radioactive byproduct material that are used by the general public and are exempted from licensing requirements if the Nuclear Regulatory Commission determines that the products or types of uses do not constitute an unreasonable risk to security, public health, safety, or the environment. Radiation safety features are built into these products or the amount of radioactive material is restricted. Two types of exempt consumer products applicable to EPA emergency responders are (1) exempt quantity use and (2) gas and aerosol detector product use. Exempt quantity use includes small quantities of byproduct material such as found in check sources and calibration standards for commercial distribution. Gas and aerosol detector product includes products such as smoke detectors and chemical agent detectors. These products contain tiny foils that provide a steady source of ions in analytical chambers. The foils are coated with radioactive material such as americium-241 or nickel-63.

External dose
The portion of the dose equivalent received from radiation sources outside the body.

External exposure
The dose of radiation received by an individual from a source of ionizing radiation outside the body.

Gray
The international system unit for absorbed dose without the quality factor being taken into consideration.

Internal dose
The portion of dose equivalent received from radioactive materials taken into the body by ingestion, inhalation, or dermal contact.

Internal exposure
The dose of radiation received by the internal organs of the body from radionuclides ingested, inhaled, or absorbed into the body.

Ionizing radiation
Any electromagnetic or particulate radiation capable of displacing electrons from atoms or molecules—directly or indirectly—on its passage through matter, thereby producing ions. Alpha and beta particles, gamma rays, x-rays, and neutrons are examples of ionizing radiation.

Licensed radioactive source
Radioactive material regulated either through a general or specific license issued by the Nuclear Regulatory Commission (NRC). The NRC's regulations provide a general license for the receipt and use of byproduct material contained in certain products. A generally licensed device usually consists of radioactive material contained in a sealed source within a shielded device, such as gas chromatograph units, fixed gauging devices, static eliminators, luminous exit signs, and calibration or reference standards. The device is designed with inherent radiation safety features so that it can be used by persons with no radiation training or experience. The general license simplifies the licensing process so that a case-by-case determination of the adequacy of the radiation training or experience of each user is not necessary. NRC evaluates the adequacy of these generally licensed products, ensuring that distributors meet the specific requirements in 10 CFR Part 32 Subpart B and that users meet the requirements in 10 CFR Part 31.

The NRC also issues specific licenses for the possession and use of byproduct, source, and special nuclear material. An organization that wishes to obtain a license to use radioactive materials must submit an application to the NRC. The application must demonstrate how the use of these materials will meet the safety requirements in NRC regulations found in 10 CFR Parts 19-20 and 30-39. Applicants must provide information on the type, form, and intended quantity of available facilities, qualifications of users, and radiation protection programs.

Millirem (mrem)
One one-thousandth of a rem.

MilliSievert
One one-thousandth of a Sievert. 1 milliSievert = 100 mrem.

National Response Framework (NRF)
The NRF is a guide that details how the nation conducts an all hazards response—from the smallest incident to the largest catastrophe (see the NRF Resource Center Web site at https://www.fema.gov/media-library/assets/documents/117791). This document establishes a comprehensive, national, all hazards approach to domestic incident response. The NRF identifies the key response principles, as well as the roles and structures that organize a national response. It describes how communities, states, the federal government, private sector, and nongovernmental partners apply these principles for a coordinated, effective national response. In addition, it describes special circumstances where the federal government exercises a larger role, including incidents where federal interests are involved and catastrophic incidents where a state would require significant support. It lays the groundwork for first responders, decision makers, and supporting entities to provide a unified national response.

Occupationally exposed worker
Individuals who have a significant potential for exposure to radiation while on the job.

Quality factor (Q)
A principal modifying factor which is used in radiation protection for deriving the dose equivalent (H), from absorbed dose (rad or Gray). The quality factor is a linear energy transfer dependent factor selected to account for the relative biological effectiveness of the radiation in question and is independent of the tissue or organ under consideration. The quality factor (Q) for beta particles, gamma rays, and x-rays is set at 1. Q for alpha particles can reach 20. Q for neutrons is between 6 and 10.

Rad
The traditional measure of absorbed dose without a quality factor taken into consideration.

Radiation Safety Officer (RSO)
The designated EPA person, qualified by virtue of education, training, and/or professional experience, who ensures that all work is conducted in accordance with the requirements of the EPA SHEM Guideline 38, Radiation Safety and Health Protection Program, and any applicable facility licenses.

Roentgen equivalent man (rem)
The unit of dose equivalent (H), for any type of ionizing radiation absorbed by the body tissue, in terms of its estimated biological effect, relative to an absorbed dose from exposure to 1 roentgen of high energy gamma or x-rays.

Sievert
The international system unit of dose equivalent. 1 Sievert = 100 rem.

Source material
Source materials are (i) uranium or thorium or any combination of uranium and thorium in any physical or chemical form or (ii) ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium, thorium, or any combination of uranium and thorium. Source material does not include special nuclear material.

Special nuclear material
Special nuclear materials are (i) plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the NRC determines to be special nuclear material, but does not include source material; or (ii) any material artificially enriched by any of the foregoing but does not include source material.

Thermoluminescent dosimeter (TLD)
A device made of a certain crystalline material that can both store a fraction of absorbed ionizing radiation and release this energy in the form of visible photons when heated. The amount of light released can be used as a measure of radiation exposure. These devices are used for monitoring whole body personal radiation exposure; they can measure both shallow and penetrating components of ionizing radiation.

Total effective dose equivalent (TEDE)
The total amount of dose received by an individual that considers any external or internal doses received. It is the sum of the committed effective dose equivalent and the whole body external dose equivalent.

APPENDIX D

Instructions for Site-Specific HASP Development: Radiation Safety Program

Emergency responders can use information from the customized version of their Radiation Safety Program chapter to develop site-specific health and safety plans (HASPs). For example, emergency responders can do the following when developing their HASP:

- **Insert customized versions of the following sections into the HASP:**

Section 3.1	Radiation Safety Training Requirements
Section 3.1.1	Basic and Advanced Radiation Safety Training Courses
Section 3.1.2	Refresher Courses
Section 3.1.3	Other Training Requirements
Section 3.2	Training Records
Section 3.3	Training Waivers
Section 4.1	Enrollment in the Personal Monitoring Program
Section 4.2.1.1	TLD Badge Training
Section 4.2.1.2	Usage, Exchange, and Storage Requirements for TLD Badges
Section 4.2.1.3	Broken, Lost, or Contaminated TLDs
Section 4.2.2	Special Dosimeters
Section 4.2.3	Self-reading Dosimeter (SRD) Program
Section 4.2.4.1	Exceeding the ARL
Section 4.2.4.2	Exceeding the ACL
Section 4.2.4.3	Special Circumstances—Planned Special Exposures and Emergency Operations
Section 4.2.5.1	Counseling Female Employees About the Potential Effects of Prenatal Radiation Exposure
Section 4.2.5.2	Declaring Pregnancy
Section 4.2.5.3	Ensuring that Radiation Exposure to the Embryo/Fetus is ALARA
Section 4.3	Internal Exposure Monitoring
Section 4.4.1	Dosimetry Records and Notification
Section 5.1	Training on Radiation Detection Instrumentation
Section 5.2	Tracking, Maintaining, and Calibrating Radiation Detection Equipment
Section 6.1	Meeting NRC License Requirements
Section 6.2	Purchase, Storage, and Security
Section 6.3	Taking an Inventory
Section 6.4	Performing Leak Tests, Wipe Samples, and Maintenance Activities
Section 6.5	Shipping and Transporting Equipment that Contains Licensed Radioactive Sources
Section 6.5.1	Transporting Exempt Sources
Section 6.5.2	Inter-regional Transportation of Equipment
Section 6.6	Disposing of and Excessing Equipment
Appendix A	Radiation Safety Program: Designation of Roles and Responsibilities
Appendix B	Radiation Safety Program: Documentation of Additional Policies and Procedures
Field Guide	Quick Reference Guide for EPA Emergency Responders: Radiation Safety
Appendix H	Sample Exposure Record Card

Note: These sections might contain more background information than is necessary for a HASP. Thus, emergency responders are encouraged to streamline and edit these sections to meet their needs.

- **Insert additional site-specific information into the HASP.** Use the sample forms included in this chapter in the HASP (e.g., Appendices E, F, G, H, J, and K). If emergency responders develop their own program-implementation forms, as opposed to using the sample forms included in this chapter, these documents will need to be incorporated into the HASP. Additionally, the HASP needs to include any site-specific procedures that are required to comply with state and local regulations.

APPENDIX E

Training Certification Letter

U.S. Environmental Protection Agency
Name of EPA Organization
Street Address
City, State and Zip Code

Month XX, 20XX

SUBJECT: Radiation Health and Safety Training Documentation

FROM: _____, (RSO/SHEMP Manager or other designated position)

TO: _____, (EPA emergency responder)

_____, (Removal Manager)

_____, (Health and Safety Program Contact)

_____, (Other applicable stakeholders)

EPA's Safety, Health and Environmental Management (SHEM) Guideline No. 38 requires emergency responders to participate in radiation health and safety training. In order to meet the training requirements, EPA personnel must participate in training courses, take examinations, and attain a score of 80 percent or higher on the associated examinations.

Please be advised that _____(Name of EPA employee)_____ has met the requirements for the following radiation health and safety training level:

___ **Basic Radiation Safety Training Course**

- Name of the course: _____.
- Location of the course: _____.
- Date the course was taken: _____.
- Did the employee receive a score of 80 percent or higher on EPA's Basic Radiation Safety Training Course examination? Yes____ No____. If "no," did the employee review the test questions and course materials with his or her manager and subsequently demonstrate an adequate understanding of the course material? Yes____ No____.

___ **Advanced Radiation Safety Training Course**

- Name of the course: _____.
- Location of the course: _____.
- Date the course was taken: _____.
- Did the employee receive a score of 80 percent or higher on the associated examination? Yes___ No___. If "no," did the employee review the test questions and course materials with his or her manager and subsequently demonstrate an adequate understanding of the course material? Yes____ No____.

___ **Refresher Radiation Health and Safety Training Course**

- Name of the course: _____.
- Location of the course: _____.
- Date the course was taken: _____.
- Did the employee receive a score of 80 percent or higher on the associated examination? Yes____ No____. If "no," did the employee review the test questions and course materials with his or her manager and subsequently demonstrate an adequate understanding of the course material? Yes____ No____.

APPENDIX F

Training Waiver

U.S. Environmental Protection Agency
Name of EPA Organization
Street Address
City, State and Zip Code

Month XX, 200X

SUBJECT: Incident-Specific Training Waivers

FROM: _____, (RSO/SHEMP Manager or other designated position)

TO: _____, (Removal Manager)

In the event of activation of either the National Response Framework or the EPA Radiological Emergency Response Plan, incident-specific special waivers of formal Safety, Health and Environmental Management (SHEM) Guideline 38 radiation health and safety training requirements may be granted.

I ____(Name/Title)_____ am granting a temporary training waiver to ___(Name of EPA employee)___ to allow this individual to perform activities at a site that has the potential for radiation exposure even though he/she has not completed EPA's official radiation health and safety training requirements yet. Although the training requirements have not been met, this employee has demonstrated sufficient knowledge about radiation hazards and the measures that should be taken to minimize these hazards. The employee is deemed proficient in these areas because:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____.

This training waiver will be in effect between _____ and _____.

_____(Signature of the RSO or SHEMP Manager or other designated position)___ (Date) _____

APPENDIX G

Paperwork Required to Enroll in the Personal Monitoring Program

TLD ENROLLMENT REQUEST FORM

ENROLLMENT CLASS	_____ Permanent (OSC, RPM, Em. Resp., Radiation Program) _____ Temporary (XRF) Date Issued _____ Date Returned _____
NAME:	
SOCIAL SECURITY NUMBER:	
DATE OF BIRTH:	
GENDER:	
MAIL CODE:	
EXTENSION:	
PREVIOUS EXPOSURE HISTORY: (See Attached)	_____ Yes _____ No
PURPOSE	

For Radiation Safety Office use only:

Change in service form:__Y __N
Training needed: __Y __N
Date training completed: _____
Extra badge assigned: __Y __N
If yes, badge number:

Rev 1
January 27, 2003

AUTHORIZATION FOR RELEASE OF
OCCUPATIONAL RADIATION EXPOSURE INFORMATION

INSTRUCTIONS: Complete this form, sign it, and return it as requested. If your answer to #2 is "NO," skip items #3, #4, and #5, and go directly to #6. If you have participated in more than one employer's radiation program, please complete and sign a separate form for each previous employer. **Be sure to sign each form since some employers will accept only release authorizations bearing "original" signatures**.

1. My name is: _____
(Print your full name)

2. _____YES, I have . . .

_____NO, I have not . . .

. . . been monitored for occupational exposure to ionizing radiation by a former employer, prior to working at EPA.

3. My former employer who monitored me for radiation exposure was:

_____
(print the name of the former employing organization)

_____
(print the street number and street address)

_____
(print the city, state, and zip code)

_____
(area code and main telephone number of employer)

DATES OF THIS EMPLOYMENT: from _____/_____ to _____/_____
(mo) (yr) (mo) (yr)

4. I HEREBY _____DO . . .
_____DO NOT . . .

. . . REQUEST AND AUTHORIZE THE RELEASE OF MY RADIATION EXPOSURE RECORDS TO EPA BY THE ORGANIZATION NAMED IN PARAGRAPH 3 ABOVE.

5. By completion of this section, I hereby consent to the use of my social security number and my date of birth in obtaining, and verifying, my radiation exposure monitoring records.

MY SOCIAL SECURITY NO. IS: _____-_____-_____.
MY DATE OF BIRTH IS: _____/_____/_____.
(mo) (day) (yr)
MY BIRTHPLACE IS: _____.

6. SIGNATURE: _____ (original signature)

APPENDIX H

Sample Exposure Record Card

INDIVIDUAL RADIATION EXPOSURE RECORD

NAME _____ SITE/EVENT _____

WORK ADDRESS _____
_____
_____

WORK PHONE _____

HOME ADDRESS _____
_____
_____

HOME PHONE _____

SSN _____

DATE OF BIRTH _____

ORGANIZATION _____

TODAY'S DATE/TIME _____

DIRECT-READING DOSIMETER

SERIAL NUMBER: _____

TLD SERIAL NUMBER: _____

INSTRUCTIONS:

Record readings at the beginning and at the end of each shift.

Notify your RSO or SHEMP Manager (or another designated person) immediately if:

1. Your dosimeter dose or dose rate alarms sound, or

2. If you have reached a one-time shift dose limit of 50 mrem, or

3. If you have reached a dose limit of 50 mrem over several shifts.

Doses of 500 mrem or higher must be authorized by the RSO or SHEMP Manager, (or another designated person) in collaboration with the senior EPA official on site (or another designated person).

Return this card to your RSO or SHEMP Manager (or another designated person).

Date	Shift Start Time/ Shift End Time	Beginning of Shift Reading	End of Shift Reading	Shift Dose (End of Shift - Beginning of Shift)	Did Any Alarms Sound? Y/N Dose/Dose Rate (if yes, indicate which)

APPENDIX I

Turnback Guidance for EPA Personnel Responding to Radiological Emergencies

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

DEC 07 2006

MEMORANDUM

SUBJECT: Turnback Guidance for EPA Personnel Responding To Radiological Emergencies

FROM: Susan Parker Bodine, Assistant Administrator
Office of Solid Waste and Emergency Response

Bill Wehrum, Acting Assistant Administrator
Office of Air and Radiation

TO: Regional Administrators (Regions 1-10)
Deputy Regional Administrators (Regions 1-10)
Superfund Division Directors (Regions 1-10)
Regional Air Division Directors (Regions 1-10)

PURPOSE

EPA is in the process of developing an Agency-wide Order implementing consistent guidance of exposure rates and total dose limits for personnel responding to radiological emergencies. In the interim, this memorandum serves to communicate guidance to EPA emergency responders in the Office of Solid Waste and Emergency Response (OSWER) and the Office of Air and Radiation (OAR) as well as EPA emergency responders across the EPA Regions. EPA managers are required to communicate this guidance to all relevant EPA staff.

All EPA emergency responders should adhere to this guidance. The exposure rates and dose limits identified below are intended to supplement current radiation policies and guidance.

BACKGROUND

Emergency response activities range from routine environmental reconnaissance sampling, inspections, and monitoring, to entering and working in environments with known and unknown hazards. The protection of personnel engaged in field activities involves training employees in safe operational procedures and establishing administrative controls to better protect our responders.

The information in this memorandum supplements the existing worker radiation exposure guidance in the following documents:

1. EPA-400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents" ("Protective Action Guides" or "PAGs") (commonly referred to as "EPA 400"), www.epa.gov/radiation/rert/pags.htm;

2. Guideline 38, Radiation Safety and Health Protection Program, Safety, Health and Environmental Management Program Guidelines ("SHEMP Guideline 38") (March 2006), http://intranet.epa.gov/oaintran/shemd/national/content/guides/38_rad_guide508.pdf; and

3. OSWER Directive Number 9285.3-12, Chapter 2, Radiation Health and Safety Implementation Plan, Emergency Responder Health and Safety Manual ("OSWER ER H&S Manual") (July 28, 2005), http://www.epaosc.org/sites%5C1598%5Cfiles%5Crad_chapter_mar05.pdf.

Specifically, the memorandum supplements the existing guidance documents by providing exposure *rates* (commonly called 'turnbacks') at which EPA emergency responders should turn back and seek further guidance before proceeding. These rates are based upon many assumptions, including the following: (1) these rates only apply to EPA responders doing work within the EPA mission and objectives; (2) these rates only apply during emergencies and are not to be applied during normal operations or site work; and (3) emergency responders as well as managers should ensure responder exposures remain as low as reasonably achievable (ALARA).

AUTHORITIES

These following authorities provide the underlying basis for the documents above.

1. Section 19, The Occupational Health and Safety Act of 1970, as amended (29 USC 668).
2. 29 CFR Part 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters.
3. Executive Order 12196, "Occupational Safety and Health Programs for Federal Employees," 45 Fed. Reg. 12769 (February 26, 1980).
4. Radiation Protection Guidance to Federal Agencies for Occupational Exposure; Approval of Environmental Protection Agency Recommendations, 52 Fed. Reg. 2822 (January 27, 1987).
5. EPA Order 1440.1, Safety, Health and Environmental Management Program (SHEMP) (May 11, 1998), http://intranet.epa.gov/rmpolicy/ads/orders/1440_1.pdf.
6. EPA Order 2040.1 A1, National Security Emergency Preparedness Policy (February 6, 2001), http://intranet.epa.gov/rmpolicy/ads/orders/20401a1.pdf.

POLICY

"Turnback Guidance for EPA Personnel Responding to Radiological Emergencies" is presented in the attached six tables. This information is intended to be used in the early stages of an emergency, when radiation health physics and health and safety assistance may not be readily available.

Table 1 shows the emergency worker dose limits provided in EPA 400. These are assumed to be once in a lifetime doses. Emergency responders may be exposed to radiation while assuring protection of others and of valuable property. These exposures could be justified if the benefit for those protected outweighs the detriment to the worker. However, lower limits should be used

whenever possible. As required by 44 CFR Part 351, EPA issued the emergency worker dose limits in EPA 400 as guidance for all response organizations in the United States.

Table 2 provides the new gamma exposure *rates* (Turnback Levels) at which EPA emergency responders should seek further guidance before proceeding. Responders using handheld gamma radiation instruments can compare their readings to the levels in the table. If the responder's activities are deemed mission-justified, entering into areas with levels higher than the turnbacks may be allowed. Exceeding the Administrative Control Level (Table 6) requires concurrence by the senior EPA official onsite, the Incident Commander, the Health and Safety Officer, or the Radiation Safety Officer (RSO). Lower levels should be used whenever possible. It is important to note that the Turnback Levels are specifically designed for EPA emergency responders acting within EPA's mission and response organization. These Turnback Levels are therefore not necessarily appropriate for use by other agencies or responders.

Table 3 provides guidance specific to detecting and protecting EPA emergency responders in the presence of loose alpha or beta contamination. Alpha and beta contamination pose an internal hazard that may complicate the responder's work. Additional personal protective equipment and detection instruments must be used. The Turnback Level of ≈ 400 cpm as detected on radiological instruments is a rough approximation based on assumptions noted in the table. Caution should be exercised in any situation involving loose or airborne alpha or beta contamination above natural background.

Table 4 provides some example "stay times" for various exposure rates. Since exposure rates can vary over small distances (because of shielding by debris or breaks in a source container), EPA responders must continuously monitor their instruments. Stay times simply provide an idea of how long before dose limits will be reached and will help in deciding whether a response activity can be completed safely.

Table 5 lists some of the possible health effects of very large radiation doses over short timeframes. Note that most of these doses are much higher than the emergency responder dose guidance from EPA 400.

Finally, Table 6 provides EPA's dose limits for non-emergency conditions from SHEMP Guideline 38. The Administrative Control Level (ACL) is 500 mrem in a year. This is one-tenth of the Occupational Health and Safety Administration (OSHA) occupational radiation worker dose limit, and over many years, EPA employee exposures have historically been below the ACL. It is possible that in a radiation emergency, however, the ACL will be waived and the EPA emergency responder dose limits and corresponding Turnback Levels will be used to protect EPA responders. **See Attached Tables.**

IMPLEMENTATION

This guidance is effective immediately. EPA managers should share this memorandum with all relevant employees to educate them about this guidance. The new Turnbacks will also be incorporated into training materials for radiation refresher courses, SHEMP Guideline 38 and the OSWER

Emergency Response Health and Safety Manual. In addition, the Office of Radiation and Indoor Air (ORIA) is developing a one-page summary for training purposes that will be posted on www.epaosc.org. If you have questions about this guidance please contact one of the following persons: OAR: Sara DeCair 202-343-9713; OSRTI: Colleen Petullo 702-798-8004; OEM: Craig Beasley 202-564-2087.

cc: Radiological Emergency Response Team (RERT)
Environmental Response Team (ERT)
National Decontamination Team (NDT)
Regional Safety, Health and Environmental Management Program
Removal Managers (Regions 1-10)
ORIA Regional Program Managers (Regions 1-10)

Turnback Guidance
for EPA Personnel Responding To Radiological Emergencies

Table 1

Table 1: EPA Emergency Responder Dose Guidance from EPA 400		
Dose Limit TEDE[a] (rem*)	**Activity**	**Condition**
5	all	None
10	protecting valuable property	Voluntary; lower dose not practicable
25	lifesaving or protection of large populations	Voluntary; lower dose not practicable
>25	lifesaving or protection of large populations	**Only on a voluntary basis to persons fully aware of the risks involved**
[a] Sum of external effective dose equivalent and committed effective dose equivalent, or TEDE, to nonpregnant adults from exposure and intake during an emergency situation. These limits apply to all doses from an incident, except those received in unrestricted areas as members of the public. These are assumed to be once in a lifetime doses. * For x and gamma radiation, Rad ~ rem ~ Roentgen (R).		
Exceeding the administrative control level requires concurrence of the senior EPA official onsite, the Incident Commander, the Health and Safety Officer, or the Radiation Safety Officer.		

Table 2

Table 2: EPA Emergency Responder Gamma Exposure Rate Turnback Levels			
Time Period	Employee Type	Turnback Level	Condition
Early Phase: (Release ongoing)	OSCs, initial EPA responders	**10 R/hr**	Voluntary, with supervisor review, for lifesaving or critical actions ONLY – evaluate anticipated doses against dose limits above
Early Phase: (Release terminated)	OSCs, RERT-Forward, ERT and initial EPA responders		
Intermediate Phase: (Some data available)	OSCs, RERT-Forward, ERT	**1.5 R/hr**	Dose management imperative
Late Phase: (Cleanup)	Any EPA employees, RERT-Support and Home Teams	Site specific according to site health and safety plan	EPA Action Reference Level: 50 mrem/quarter *and* Administrative Control Level: 500 mrem/year
Important: DOSE MANAGEMENT should begin at 1 millirem per hour			

5

Table 3

Table 3: Respiratory Protection and Alpha/Beta	
Personal protective equipment (tyvek, boots, gloves) should be worn in the presence of *any* alpha or beta contamination above natural background.	
Appropriate respiratory protection should be worn in the presence of *loose* alpha or beta contamination above natural background.	
Incidents involving airborne alpha or beta emitters require proper instrumentation as noted below.	
At all times, worker exposures should be As Low As Reasonably Achievable.	
Alpha on the ground turnback level	**Beta** on the ground turnback level
≥2,000 dpm/100 cm² {≈ **400 cpm** with Ludlum model 2241-2 (or comparable) coupled with alpha probe model 43-90}	**10,000 dpm/100 cm²** {≈ **400 cpm** with Ludlum model 2241-2 (or comparable) coupled with pancake probe model 44-9}
Leave the area until you have protective clothing and respiratory protection - evaluate actions against dose limits	**Leave the area** until you have protective clothing and respiratory protection - evaluate actions against dose limits
Informed safety decisions regarding subsequent site activities should be made based on air sample analysis and nuclide identification. These values assume a static measurement on the ground (or a flat surface) at a distance of 1cm. Alpha-only or beta-only instruments may respond erroneously in a high gamma rate field – be aware!	

Table 4

Table 4: Early and Intermediate Phase *Example* "Stay Times"			
Exposure rates ↓	Up to **5 rem** TEDE limit for emergency operations	Up to **10 rem** TEDE when lower dose not practicable, only for protecting valuable property or infrastructure	Up to **25 rem** TEDE when lower dose not practicable, only for lifesaving or protecting large populations
0.1 R/hr	50 hours	100 hours	250 hours
1 R/hr	5 hours	10 hours	25 hours
5 R/hr	1 hour	2 hours	5 hours
10 R/hr	30 min.	1 hour	2.5 hours
25 R/hr	12 min.	24 min.	1 hour
50 R/hr	6 min.	12 min.	30 min.
100 R/hr	3 min.	6 min.	15 min.
Exposure rates or total doses in the shaded areas exceed guidance levels and are to be used only when critical actions or lifesaving are warranted. This table is for gamma only – if airborne alpha or beta are present, appropriate respiratory protection must be used.			

Table 5

Table 5: Potential Biological Effects of High Doses of Radiation in a Short Time Frame		
Dose (Rad)*	Dose	Potential Biological Effects
1,000	1,000,000 mR	death due to central nervous system damage within hours
350	350,000 mR	No treatment: death within 60 days for 50% of exposed population (with treatment, up to 800 Rad)
300	300,000 mR	female sterility
200	200,000 mR	male sterility
100	100,000 mR	nausea
25	25,000 mR	detectable blood changes
15	15,000 mR	temporary decreased sperm count
* For x and gamma radiation, Rad ~ rem ~ Roentgen (R). Note that these are total doses that if received over a very short timeframe, may manifest harmful biological effects. If large doses are received over longer timeframes, biological effects may or may not be manifested.		

Table 6

Table 6: Non-Emergency Conditions (from SHEMP Guideline 38)
Administrative Control Level (ACL): **500 mrem/year**
EPA's ACL is a committed effective dose equivalent from intake plus external whole-body dose in any period of twelve (12) consecutive months. Exposure data for EPA workers over several years indicate that this ACL is reasonably achievable. This ACL is the maximum acceptable dose for an individual worker during any period of twelve consecutive months. If a worker has reached the ACL, work assignments with a potential for additional radiation exposure should be restricted until the ACL is again satisfied.
EPA Action Reference Level (ARL): **50 mrem/quarter**
The ARL is a whole-body external exposure or internal effective dose equivalent, intended to alert supervisors and workers to the constant need for maintaining good radiological protection practices, and to ensure that long-term worker exposure does not exceed the ACL. Any worker's exposure that exceeds this ARL shall immediately trigger a review of the circumstances relating to the excursion. The review may ultimately result in modification of operating practices, remedial training, or the institution of other preventive or control measures. This review should be performed by the RSO or Designated SHEMP Official in collaboration with the worker, the worker's supervisor, the manager of the work area or site and, if needed, a health physicist.

APPENDIX J

Memorandum for Declaration of Pregnancy

MEMORANDUM

SUBJECT: DECLARATION OF PREGNANCY

FROM: _____

TO: _____

In accordance with the NRC's regulations at 10 CFR 20.1208, "Dose to an Embryo/Fetus," I am declaring that I am pregnant. I believe I became pregnant in _____ (month and year).

I understand the radiation dose to my embryo/fetus during my entire pregnancy will not be allowed to exceed 0.5 rem (500 mrem). I also understand that meeting the lower dose limit may require a change in job or job responsibilities during my pregnancy. These changes will be coordinated with the Radiation Safety Officer (RSO) and my supervisor.

I understand that I will be placed on a monthly dosimeter exchange cycle to ensure compliance to the administrative exposure limit (ACL).

Once the pregnancy is concluded, or at such time as I wish to revoke my pregnancy declaration, I shall notify you in writing, so I can resume my normal duties. If I fail to withdraw this declaration at the conclusion of my pregnancy, I understand that this submittal will expire one year after the submission date.

_____
Employee Signature

_____
Employee Printed Name

_____
Date