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**Environmental Restoration Project  
Standard Operating Procedure**

for:

**Performing and Documenting Gross  
Gamma Radiation Scoping Surveys**

**NES Approved**

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## Revision Log

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0 03/28/2001	James Santo	New procedure.	All
Review 12/16/2003	Becky Coel-Roback	Process deemed adequate.	All

# Performing and Documenting Gross Gamma Radiation Scoping Surveys

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# Performing and Documenting

## Gross Gamma Radiation Scoping Surveys

**NOTE:** Subcontractors may follow this standard operating procedure (SOP) for gross gamma radiation scoping surveys or may use their own procedure(s) as long as the substitute meets the requirements prescribed by the Laboratory's LPR 308-00-00.1, Quality, and have been approved by the Environmental Restoration (ER) Project's Quality Program Project Leader (QPPL) before the commencement of the survey activities.

**NOTE:** ER Project personnel may produce paper copies of this procedure printed from the controlled-document electronic file located at <http://erinternal.lanl.gov/documents/Procedures/qps.htm>. However, it is their responsibility to ensure that they are trained to and utilizing the current version of this procedure. The author may be contacted if text is unclear.

### 1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the process for performing and documenting gross gamma radiation scoping surveys for radioactivity in buildings and soils at the Los Alamos National Laboratory (Laboratory) ER Project.

- 1.1 If the data collected during the historical site assessment indicate an area may be impacted with radiological contamination a scoping survey should be performed. Scoping surveys provide site-specific information based on limited measurements. The primary objectives of a scoping survey are to:
  - Perform a preliminary hazard assessment
  - Support classification of all or part of the site in need of further characterization
  - Provide input to the characterization survey design if necessary
- 1.2 Scoping surveys are conducted after an assessment of the site history is completed and consist of judgment measurements based on the historical site information and data. If the scoping survey locates contamination, a characterization survey is typically performed. Sufficient information should be collected to identify contaminated locations and situations that require immediate radiological attention. This procedure does not cover the scope of a characterization survey which should be performed by qualified personnel who have been trained in the proper implementation of survey techniques as described in the Multi-Agency Radiological Survey and Site Investigation Manual (MARSSIM) USNRC NUREG 1575 / EPA 402-R-97-016.

## 2.0 TRAINING

- 2.1 The **Field Team Leader** (FTL) is responsible for ensuring that field team members who conduct gross gamma radiation scoping surveys for the ER Project are familiar with the objectives of and properly trained in conducting response/performance checks of radiation instrumentation and documentation of radiation measurements. In addition, all field team members must document that they have read and understand this procedure in accordance with QP-2.1, Documenting Personnel Qualifications and QP-2.2, Personnel Orientation and Training.
- 2.2 Field radiation surveys are to be conducted only by qualified radiological screening personnel (RSPs), health protection technicians (HPTs), or radiation control technicians (RCTs). Qualification is documented by an ESH-1 radiological surveillance authorization agreement (RSAA), as discussed in the ER Project Health and Safety Plan (HASP) and ESH-1 procedure ESH-1-01-03, Radiological Surveillance Authorization Agreement. Training requirements include reading this procedure and completing a one-hour, hands-on, procedure-specific training provided by another RSP, HPT, or RCT who is experienced in using this procedure.

## 3.0 DEFINITIONS

**NOTE:** A glossary of definitions can be located on the ER Project internal homepage <http://erinternal.lanl.gov>.

- 3.1 Judgement Measurement— Measurements performed at locations selected using professional judgment based on unusual appearance, location relative to known contaminated areas, high potential for residual radioactivity, general supplemental information, *etc.*
- 3.2 Background Radiation— There are two types of background radiation to be considered in the implementation of this SOP: 1) Radiation from cosmic sources, naturally occurring radioactivity including radon (except as a decay product of *source* or *special nuclear material*), and global fallout as it exists in the environment from the testing of nuclear explosive devices or from nuclear accidents like Chernobyl which contribute to *background radiation* and are not under the control of the cognizant organization. *Background radiation* does not include radiation from *source*, *byproduct*, or *special nuclear materials* regulated by the cognizant Federal or State agency. Different definitions may exist for this term. The definition provided in regulations or regulatory program being used for a site release should always be used if it differs from the definition provided here and 2) the instrument background, which is intrinsic to the type of radiation detector chosen and affects its ability to identify radioactivity below a certain level.

- 3.3 Scoping Survey—A type of *survey* conducted to identify the presence of gross gamma radioactivity above the background level that can be measured with the specific detector, and to define the extent of the contamination that can be detected above the instrument’s intrinsic background level.
- 3.4 Site-Specific Health and Safety Plan (SSHASP)—A health and safety plan that is specific to a site or ER-related field activity that has been approved by an ER health and safety representative. This document contains information specific to the project including scope of work, relevant history, descriptions of hazards by activity associated with the project site(s), and techniques for exposure mitigation (e.g., personal protective equipment [PPE]) and hazard mitigation.

## 4.0 BACKGROUND AND PRECAUTIONS

**Note:** This SOP is to be used in conjunction with an approved SSHASP. Also, consult the SSHASP for information on and use of all PPE.

- 4.1 This procedure allows properly trained ER personnel to conduct radiological measurements for the purpose of identifying radioactivity levels above the instrument’s background in buildings or soil. This procedure does not cover the scope of determining surface and volume contamination levels for the potential release of non-radioactive material for public landfill disposal or beneficial use or recycle. Free release of material should be performed in accordance with Laboratory Procedure LP107-04.1, “Releasing Materials and Equipment” and ER-SOP-10.07, “Field Monitoring for Surface and Volume Radioactivity Levels” by qualified personnel only.

## 5.0 EQUIPMENT

Descriptions of commonly used pieces of equipment.

### 5.1 Survey Equipment for Soil or Other Material Suspected of Plutonium or Americium Contamination

- Ludlum Model 2221 Scaler/Ratemeter (or the equivalent) used with Teledyne Isotopes NaI (TI) FIDLER detector (or equivalent)

### 5.2 Survey Equipment for Other Gamma-Ray Radionuclide Contaminants

- Ludlum Model 2221 Scaler/Ratemeter with Model 44-10 2x2 Gamma Scintillator or equivalent
- Ludlum Model 19 MicroR Meter or equivalent

## 6.0 PROCEDURE

**Note:** Deviations from SOPs are made in accordance with QP-4.2, Standard Operating Procedure Development and documented in accordance with QP-5.7, Notebook Documentation for Environmental Restoration Technical Activities.

### 6.1 Preparing for the Survey

- 6.1.1 Inspect the instrument for obvious damage. If the instrument is damaged, obtain another.
- 6.1.2 Check the battery and record the result on the Daily Activity Log or in a field notebook. If the check indicates low battery power, replace the batteries.
- 6.1.3 Set the meter response to fast if appropriate.
- 6.1.4 Check that other ratemeter/scaler settings are appropriate. For example, on a ratemeter/scaler with an adjustable threshold and window, the threshold should be set at 100 and the window should be set to open. Verify the High Voltage bias of the instrument is set according to the correct voltage as specified in the calibration records. Record all instrument settings on the Daily Activity Log or in a field notebook.
- 6.1.5 Check the calibration sticker and record the date on the Daily Activity Log or in a field notebook. If the calibration due date has passed, obtain another calibrated instrument.
- 6.1.6 Check the operation of the detector by placing the detector over a gamma check source and ensuring that the detector responds. Note where the detector and check source are placed, relative to each other, each time. Record the results on the Daily Activity Log or in a field notebook. Ensure that the results are within 20% of the previous day's operational check result (see Section 6.4.2).
- 6.1.7 Determine the background of the instrument by taking 10 one minute counts in an area geologically similar to the area to be surveyed but known to be free of radioactive contamination. Average the ten measurements and use this value as an approximate measurement of instrument background for the purpose of the scoping survey only.

### 6.2 Conducting the Survey

**NOTE:** The survey should be conducted as described below and using judgement measurements as defined in Section 3.1. Further description of the use of judgement measurements in performing radiological scoping surveys can be found in the Multi-Agency Radiological Survey and Site

Investigation Manual (MARSSIM) USNRC NUREG 1575 / EPA 402-R-97-016.

- 6.2.1 Turn the instrument on and turn up the audible response.
- 6.2.2 Walk slowly over the survey area while holding the detector approximately 6 inches to 1 ft above the ground. Listen for increases in audible response (headphones are recommended), and look for needle deflection or digital response in the meter. Although both indicate an increase in radiation levels, personnel tend to respond more quickly to the audible signal.
  - 6.2.2.1 If an increased measurement of two to three times background is noted, vary the height and direction of the detector to determine the maximum radiation level.
  - 6.2.2.2 Hold the detector at that point for at least 15 s to obtain an accurate count on the instrument scaler.
- 6.2.3 To obtain a contact reading of an object or surface, place the detector directly on the object or surface and hold it there for at least 15 s to obtain an accurate count on the instrument scaler. If the object or surface is known or suspected to have loose contamination, exercise good radiation-safety practices, and do not allow the detector to contact the object or surface.
- 6.2.4 Give particular attention to drain lines, pipes, ducts, pits, sumps, or any other places where radionuclides could concentrate.
- 6.3 Concluding the Survey
  - 6.3.1 Record all survey locations and count rates (from Sections 6.2.2 and 6.2.3) and observations (from Section 6.2.4) on the Daily Activity Log or field notebook.
  - 6.3.2 If necessary, ensure that all survey locations are properly staked and the Location IDs are clearly visible on the stakes.
  - 6.3.3 At the end of field activities, ensure that all equipment is accounted for, decontaminated (as per ER-SOP-1.08), and ready for shipment.
- 6.4 Quality Assurance/Quality Control
  - 6.4.1 Before surveying each day, check the operation of the instrument as described in "Preparing for the Survey," Section 6.1.6. Be careful to place the detector and check source in the same place, relative to each other, each time.



6.4.2 If the result of the operational check varies more than 20% from the previous day's result, check and replace if necessary the instrument's battery, check the cabling, and check the instrument's settings. If the malfunction of the instrument can be easily fixed, perform the maintenance, and redo the performance check. If the results still vary from more than the 20% criteria a determination will need to be made by qualified personnel to repair or replace the instrument. I

## 7.0 REFERENCES

The following documents have been cited within this procedure.

LPR 308-00-00.1, Quality

QP-2.1, Documenting Personnel Qualifications

QP-2.2, Personnel Orientation and Training

QP-4.2, Standard Operating Procedure Development

QP-4.3, Records Management

ER-SOP-1.08, Field Decontamination of Drilling and Sampling Equipment

Environmental Restoration Project Health and Safety Plan, Rev. 0, March 24, 1995

ESH-1-01-03, Radiological Surveillance Authorization Agreement

USNRC NUREG 1575/EPA 402-R-97-016, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)

## 8.0 RECORDS

The **FTL** is responsible for submitting the following records (processed in accordance with QP-4.3, Records Management) to the Records Processing Facility (RPF).

8.1 Field Notebook

8.2 Daily Activity Log

8.3 Training Documentation

8.4 Radiation Instrument Performance Check Log

8.5 Radiation instrument Response Check Log

8.6 Instrument Calibration Documentaion

## 9.0 ATTACHMENTS

None

[Using a token card, click here to record "self-study" training to this procedure.](#)

If you do not possess a token card or encounter problems, contact the RRES-ECR training specialist.