



DEPARTMENT OF PUBLIC SAFETY POLICIES & PROCEDURES



POLICY NUMBER

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R-1

SUBJECT: RADIOLOGICAL-NUCLEAR DETECTION ALARM RESPONSE

1.0 PURPOSE

This policy provides guidance to properly trained Department of Public Safety (DPS) personnel in the use of radiation detection and isotope identification equipment to classify radioactive substances and to ascertain their legitimacy. There are many legitimate sources of radiation including naturally occurring radioactive material (NORM) and authorized commercial radioactive materials that may be encountered. The alarming of radiological detection equipment does not automatically imply a hazard or a violation. Unidentified radioactive materials, or those deemed not in compliance with all applicable laws, will be processed in accordance with this policy.

The purpose of this policy is to provide a systematic, coordinated procedure for radionuclide detection and isotope identification, to include inspecting vehicles for hazardous materials, and responding to a possible threat or violation. This policy establishes guidance for routine screening, assessing, and monitoring a developing threat, notifying appropriate federal, state, and local agencies to the nature of the threat, and deploying the requisite advisory and technical resources in facilitating interagency and interdepartmental coordination of an interdiction management response. This policy describes the organizational, environmental, technological, and management requirements that are relevant to the mission and describes various options that may be considered by individual localities.

2.0 POLICY

DPS may deploy a variety of radiological/nuclear detection (RND) devices to identify non-regulatory shipments of radiological/nuclear materials. Commissioned personnel may deploy this equipment while on patrol, at special event venues, and at intelligence driven locations. Commissioned personnel will utilize the protocols contained within this policy and its attachments to properly adjudicate alarms and share intelligence information while ensuring their personal safety and the safety of the community. Actions should be conducted in accordance with existing procedures for hazardous materials, suspicious device/packages, and unknown hazards. All responses potentially involving Nuclear/ Radiological incidents should treat the incident as suspect until proven otherwise.

The use of RND equipment will be limited to trained and qualified commissioned personnel. Commissioned personnel shall be trained prior to utilizing RND equipment and attend periodic refresher training.

3.0 APPLICABILITY

This policy applies to all DPS personnel who utilize radiation detection and/or radioisotope identification instruments.

4.0 REFERENCES

NONE

5.0 DEFINITIONS

- A. Alarm** – Either an audible, vibration, or visual notification from the radiation detector indicating the detection and presence or possible presence of radioactive material.

- B. Alarm Type** – A visual indication on the detector screen showing the type of radiation that has been detected. May be either Gamma Ray or Neutron.
- C. Background Radiation** – Radiation that is constantly present in environment from naturally occurring radioactive material (NORM) within the earth's surface, cosmic rays from outer space, and man-made sources of radiation such as medical x-rays, fall-out from nuclear detonation, and legitimate uses of radiation in industry.
- D. Dosimeter** – A personnel monitoring instrument that measures the radiation dose received by an individual using the device. Similar in appearance to PRDs, dosimeters are utilized for personnel safety monitoring. Dosimeters typically do not have the sensitivity of a PRD, but have a much broader detection range (e.g., 50 microR/hr to over 10 R/hr).
- E. Gamma Ray** – Gamma rays are ionizing radiation, capable of penetrating paper, skin, wood, thin layers of metal, and other substances. Because of its penetrating nature, high levels of gamma radiation are a hazard to the entire body and its organs. Examples of some gamma emitters – iodine-131, cesium-137, cobalt-60, radium-226, and technetium-99m.
- F. Naturally Occurring Radioactive Material (NORM)** – Naturally occurring radioactive materials include primordial radionuclides that have been present in the rocks and minerals of the earth's crust since it was formed. Cosmogenic radionuclides, produced by interactions of atoms in the atmosphere with cosmic rays, are a second source of naturally occurring radioactive materials. Examples of commonly encountered naturally occurring radionuclides are potassium-40 (K-40), uranium-238 (U-238), thorium-232 (Th-232), and radium-226 (Ra-226).
- G. Neutron** – Neutrons are high-speed subatomic nuclear particles with an exceptional ability to penetrate materials due to their lack of a positive or negative charge. Neutrons can travel great distances in air and require very thick hydrogen-containing materials (such as concrete or water) to block them. Neutron emitters are not common; they are most often associated with nuclear reactors, "special nuclear materials" (weapons materials), and a limited number of research and industrial sealed sources. A person should not emit neutrons.
- H. New Mexico Environmental Department (NMED)** – A governmental agency within the state of New Mexico that is responsible for environmental maintenance and monitoring.
- I. Operator(s)** – Personnel who have been properly trained in the operation of the personal radiation detectors, radiation survey instruments, secondary radioisotope screening devices, and/or radiation portal monitors.
- J. PRD** – Personal Radiation Detector, a small "pager" style detection instrument, such as the miniRad-D or Thermo RADEYE-PRD and RADEYE-GN, worn by an individual. A PRD can detect the presence of gamma radiation at very low levels. A PRD is often the first indication that radiological/nuclear material is present. Although good for finding contraband radioactive material, many PRDs do not have the range necessary for personal protection (e.g., cannot detect high dose rates), unless an extended range option is procured.
- K. RIID** – Radioisotope Identification Device, a handheld device, such as the low-resolution IdentiFinder and Interceptor or the high-resolution Ortec High Purity Germanium (HPGe) detector, used for radionuclide identification.
- L. RAM** – Acronym for Radiological Material.

M. Radiological Measurements:

1. **Counts Per Minute (CPM)** – Detection rate of ionizing radiation events in a minute. Common unit of measure for radiation/contamination monitoring equipment
2. **Counts Per Second (CPS)** – Detection rate of ionizing radiation events in a second. This unit typically used for measurements when higher count rates or rapid changes in radiation levels are anticipated. Common unit of measure for radiation/contamination monitoring equipment. Often used as unit of measure for PRD neutron detectors.
3. **Curie (Ci)** – Amount of radioactive material in which 3.7×10^{10} atoms decay per second. Common unit for describing the amount of radioactivity in a radiation source/radioactive material manifest.
4. **Dose Rate** – The amount of energy absorbed by matter received from ionizing radiation per unit mass of matter in a given amount of time; for human exposure, typically expressed in rads per hour or rem per hour.
5. **Exposure Rate** – A measure of the ionization produced in air by X-ray or gamma radiation; typically expressed in roentgens per hour (R/hr).
6. **Rad (Radiation Absorbed Dose)** – A unit to express the amount of energy absorbed from any type of ionizing radiation in a given material.
7. **Rem (Roentgen Equivalent Man)** – A unit that expresses the relative biological effects of the different types of radiation on human tissue.
8. **Roentgen (R)** – Unit of exposure, indicating the ionization produced in air by X-ray and gamma radiation. It is the primary standard of measurement used in the emergency responder community in the United States, and a common unit of measure for law enforcement PRD gamma detectors that indicate dose rate (versus 1 – 9).

** For the purpose of the ASTM E2601-08 standard, 1 R of exposure is equal to 1 rem of dose to the human body. For NMRND operational purposes, Rad, Rem, and Roentgen are used interchangeably.
9. **PRD and RIID Radiation** measurements are typically scaled using metric prefixes:
 - a. **Milli (m)** – One-thousandth of a unit, i.e., milliroentgen (mR), $1000 \text{ mR} = 1 \text{ R}$
 - b. **Micro (μ)** – One-millionth of a unit, i.e. microroentgen (μR), $1,000,000 \mu\text{R} = 1 \text{ R}$

6.0 PROCEDURE**A. GENERAL REQUIREMENTS**

1. Operator

Each time, prior to utilizing radiation detection equipment, operators will confirm that the equipment is functioning properly, by performing the necessary battery check and testing procedures as described in training/by manufacturer.

- a. Upon being issued a PRD, personnel shall turn it on and set to “vibrate” (unless directed otherwise for a specific mission), and turn it off prior to returning it.
- b. Detectors that do not pass internal testing procedures will be placed out of service.

- c. Damaged radiation pagers shall be placed out of service and returned to supervisor for repairs.
- 2. Alarm Settings
 - a. Different alarm settings may be utilized for different monitoring missions (e.g., routine patrol versus special events, versus incident response). Alarm settings should be verified appropriate, as described in training, prior to deployment.
 - b. Personnel shall not change the radiation detection equipment alarm settings or internal operating parameters without advance authorization from the DPS Radiation Safety Officer (RSO).
- 3. Safety – Control and Turn-Back Levels
 - a. Establish public control boundary at 2 mR/hr (or where equipment reading transitions from “8”) when investigation of an unknown condition is in progress.
 - b. Do not remain in areas greater than 100 mR/hr any longer than required for activities.
 - c. Do not proceed into areas with dose rates greater than 1 R/hour (1,000 mR/hr) unless directed to do so by the incident commander.
 - d. Do not enter areas exceeding 10 R/hr (10,000 mR/hr).

B. PRIMARY SCREENING - INITIAL RAD/NUC DETECTION

The DPS Primary Screening Process is summarized in *Alarm Response Flow Charts (Attachment A)*. Primary screening operator aids are provided in *PRD, RIID, and Technical Reachback Operator Aids (Attachment B)*.

Special Note: If immediate threat source(s) or conditions are encountered or perceived during any part of the alarm resolution process, secure the individual, isolate any belonging(s) or vehicle(s), and notify a supervisor so that the HAZMAT/CBRNE Team, Bomb Squad, FBI, and/or DPS RSO may be notified, as appropriate. Secondary Screening shall be initiated at this time in accordance with instructions from the supervisor and/or the FBI.

The adjudication of an alarm can take place at any time during the alarm response process. Commissioned personnel will take into consideration the totality of circumstances to make a decision on whether to take no further action or to initiate the next phase of the alarm response procedure.

- 1. When a radiation alarm is encountered during primary screening activities:
 - a. Immediately note the dose rate/alert level and type of radiation (gamma or neutron) displayed on the detector.

Note: *[Device Dependent]* Personnel who have been assigned RadEye PRDs should take note of whether the instrument is indicating a low, balanced, or high energy source. This information, while not conclusive, can be used to help resolve the alarm.
 - b. Attempt to verify the alarm, either with the same detector or an independent device, and localize the source.

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- c. Once the reading has been confirmed (e.g., repeated reading, not a spurious alarm), notify communications to create a call for service and inform location. Communications will notify the supervisor on duty of the call.
- d. Once the source is localized, the officer may detain the individual(s) for further investigation if they suspect criminal activity and or a regulatory compliance violation based on reasonable suspicion or the totality of circumstances.

Note: For the purpose of this policy an RND equipment alarm, on its own, DOES NOT constitute reasonable suspicion to detain and search an individual/vehicle. The totality of the circumstances must be taken into account when conducting RND missions.

- e. If the perceived source is a vehicle or object, isolate the individuals(s) from the vehicle/object(s) to determine the location of the detected source of radiation.
 - f. Investigate/question to determine if source is non-threat.
 - i. Utilizing standard law enforcement investigative techniques, question individual(s) as to cause of elevated radiation detection. Example types of questions include:

“I have detected elevated radiation levels being emitted from you/your car/possessions.

 - 1. Are there any reasons for there to be elevated radiation in your car/possessions?”
 - 2. Are you aware of any radioactive material in, on, or around you?”
 - ii. Commissioned personnel will use the totality of the information available to them, including behaviors, interview information, and the nature/location of the possible radiological concern to support a preliminary assessment for the alarm and determine if further investigation is required.
 - g. Contact communications to request a supervisor for secondary screening/isotope identification if the source is not consistent with the list of legitimate radiation sources or the level and distribution of the radioactivity does not correlate with the materials described in the manifest for the conveyance or information revealed during the investigation. Document on *Radioactive Materials Incident Form (Attachment C)* and contact a secondary screening officer.
2. Readings above 5 mR/h may occur during the investigation, especially close to the person or object producing the radiation; however, if consistently elevated readings more than a foot away from objects or walls are encountered that cannot be immediately explained (above 2 mR/hr, or "8 - 9" on 1-9 PRD's), personnel should take the following protective measures:

Move away from the location of the suspected radiation source until a valid rate reading (less than 2 mR/hr or "8" or less) is displayed. This will help ensure that personnel are not within a high radiation exposure area.

- a. Secure the area
- b. Establish a safety zone/control perimeter at the 2 mR/hr boundary (or where the pager reading transitions from "9 to 8").
- c. Notify a supervisor and continue to investigate.

3. All commercial vehicles shall be screened at ports of entry's that have radiation nuclear detection portals. If the conveyance triggers the primary screening portal and the radiation alarm is obviously not caused by NORM, than the conveyance shall be moved to the secondary portal for rapid radionuclide identification. If the isotope identification is consistent with legitimate radiation sources and the level and distribution of the radioactivity correlates with the materials described in the manifest for the conveyance, no further action will be taken by personnel. If the conveyance triggers a neutron alarm, the conveyance shall be moved to the secondary portal for radionuclide identification and further alarm adjudication.

C. SECONDARY SCREENING - RADIATION SOURCE IDENTIFICATION

The DPS secondary screening process is summarized in *Alarm Response Flow Charts (Attachment A)*. Secondary screening operator aids are provided in *PRD, RIID, and Technical Reachback Operator Aids (Attachment B)*.

Special Note: Prior to the deployment of a Radioisotope Identification Device (RIID) in an operational environment, operators shall ensure that internally stored RIID spectra files have been removed and stored, and the RIID date and time verified as accurate.

1. In the event an alarm is unable to be determined as a legitimate nuclear material (adjudicated) during the primary screening process, the secondary screening process found in *Alarm Response Flow Charts (Attachment A)* should be followed. During this secondary screening, a RIID shall be utilized to identify the isotope(s) present.
2. Conduct secondary screening, e.g., perform isotope identification spectrum collection and additional surveys, in accordance with training/equipment procedures. Review all information obtained by the primary screener.
3. The following measurements should be obtained (shorter spectra acquisition times may be used as the situation/safety conditions warrant):
 - a. Three (3) minute spectrum of the unknown source/material of concern;
 - b. Three (3) minute spectrum of a known isotope;
 - c. Three (3) minute background spectrum; and
 - d. Two (2) gamma dose rate measurements at two (2) different distances.
4. If there are multiple hot spots on the vehicle/belongings, capture spectra for each, if practical.
5. A HAZMAT/CBRNE team may be requested at any time to support further investigation with secondary screening, safety equipment, etc.

D. REACHBACK/TECHNICAL ASSISTANCE

Reachback involves Federal level support for more advanced technical and/or adjudication assistance. The DPS Reachback process is summarized in *Alarm Response Flow Charts (Attachment A)*. Technical Reachback operator aids are provided in *PRD, RIID, and Technical Reachback Operator Aids (Attachment B)*.

1. The RIID operator shall notify the Supervisor and submit spectra and incident information to DNDO JACCIS/DOE TRIAGE for technical assistance/spectroscopic support if:

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- a. The source identified is not consistent with the list of Common Innocent Radiation Sources provided in *Common Innocent Radiation Sources (Attachment D)*;
- b. Unexplained special nuclear material is suspected/identified, e.g., Plutonium-239, Neptunium-237, etc. see *Radiological/Nuclear Isotopes of Concern (Attachment E)*;
- c. The level and distribution of radioactivity does not correlate with the materials described in the shipping documents and/or the verbal account provided by the individual in question;
- d. Detection equipment, law enforcement data, and other relative information cannot conclusively identify the source of radiation;
- e. There is indication of credible threat material;
- f. There is confirmed detection/indication of unexplained neutrons; and
- g. There is uncertainty concerning the RIID characterization.

Repeat/longer spectra acquisition times may be requested by Reachback staff.

2. The RIID operator shall utilize *Radioactive Materials Incident Form (Attachment C)* to record alarm incident and secondary screening information.
3. If further technical assistance is warranted, the regional DOE Region 4 Radiological Assistance Program (RAP) team may be contacted.

E. ALARM ADJUDICATION

1. Threat condition identified/suspected
 - a. DPS will make notifications to the FBI, NMDPS RSO, NMED, and/or other Federal, state, and local agencies as needed, if not completed earlier.
 - b. The FBI will work with DPS to assess the situation and coordinate the needed emergency response resources to further respond to and adjudicate a potential/confirmed radiological/nuclear threat condition.
 - c. DPS representatives will determine how to isolate and secure the driver/individual(s), belongings, vehicle, and radiation source, in accordance with guidance provided by the FBI/NMED, as appropriate.
 - d. EOD personnel will handle any incident where an explosive device may or may have already dispersed a radioactive material to cause panic, injury, or death.
2. Non-Threat Adjudication
 - a. The alarm may be adjudicated as a non-threat if:
 - i. The isotope identification is consistent with the *Common Innocent Radiation Sources (Attachment D)*;
 - ii. The level and distribution of the radioactivity correlates with the materials described in the interviews/verified shipping documents; and
 - iii. There is no indication of threat material.
 - b. The alarm may also be adjudicated as a non-threat if the operator cannot verify the presence of radiation.

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- c. The alarm may be adjudicated as a non-threat, but additional regulatory action may be required to resolve the incident if any of the following occur:
- The level, distribution, and/or isotopic character of the radioactivity are not in agreement with the shipping documents;
 - Radioactive materials are not labeled and or placarded/controlled in accordance with DOT requirements; and
Radiation levels exceed regulatory limits. For regulatory guidance, contact a DPS CVSA Level 6 Inspector.
 - If the individual is not licensed to possess radioactive material in the State of New Mexico.

F. Evidence Retention

As Directed by the FBI/WMD Coordinator and/or NMED RCB (as appropriate for the incident), the following should be retained and stored:

- RIID spectral files (e.g, operator download files from RIID and/or retain entire device with copy of operating software as evidence);
- Digital/hardcopy photographs, incident forms, and other emails and notes; and
- Any radiological materials/device recovered from the incident.

G. AGENCY CONTACT NUMBERS

Federal Bureau of Investigation Albuquerque Division Weapons of Mass Destruction Coordinator	(505) 889-1300 Dial 0 at prompt
Joint Analysis Center (JAC) – Domestic Nuclear Detection Office (DNDO)	877-DNDO-JAC (877) 363-6522 dndo.jac@dhs.gov
New Mexico State Police Radiation Safety Officer	(505) 660-5441
New Mexico Environment Department's (NMED) Radiation Control Bureau (RCB) Working hours: Off-hours, NMED 24-hour emergency assistance line:	(505) 476-8600 (505) 660-3707
New Mexico's Joint Terrorism Task Force (JTTF), 24/7	(505) 889-1300, Dial 0 at prompt
Radiation Assistance Program (RAP) Region 4: DOE Emergency Operations Center 24 hour hotline:	(505) 845-4667 (202) 586-8100
TRIAGE (DOE/NNSA Emergency Operations Center) Ask to speak to either the Nuclear Incident Team Operations (NITOPS) or the on-call Emergency Response Officer (ERO).	(202) 586-8100 https://triage-data.net/triageExternal/app

H. TRAINING

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The Training and Recruiting Bureau shall be responsible for providing training on the operation of the radiation portal monitors, personal radiation detectors, survey meters, and radioisotope identification devices. The Training and Recruiting Bureau shall also ensure that personnel trained to operate this equipment and instruments understand how to adjudicate radiation alarms pursuant to this policy.

I. MAINTENANCE OF RADIOLOGICAL EQUIPMENT

1. DPS personnel are prohibited from conducting any maintenance on the radiation detection equipment. This does not exclude trained personnel from changing batteries in the personal radiation detectors or radioisotope identification devices.
2. District commanders are responsible for ensuring that all radiation detection equipment is operational and shall immediately report to the Special Operations Bureau when equipment is in need of maintenance or is inoperable.

7.0 ATTACHMENTS

- A. Alarm Response Flow Charts: Primary, Secondary, and Technical Reachback**
- B. PRD, RIID, and Technical Reachback Operator Aids**
- C. Radioactive Material Incident Form**
- D. Common Innocent Radiation Sources**
- E. Radiological Isotopes of Concern**
- F. State of New Mexico Radiological and Nuclear Detection – Program Strategy**
- G. State of New Mexico Radiological and Nuclear Detection – Equipment Capabilities and Procurement Guidelines**
- H. State of New Mexico Radiological and Nuclear Detection – Concept of Operations**

8.0 APPROVAL

APPROVED BY: S/ Scott Weaver DATE: August 2, 2016
DPS Cabinet Secretary