

# Radiological Dispersal Device (RDD) Recovery Guidance: After Action Report from Pilots

Responding to Feedback from Pilots  
Reviewing RDD Recovery Guidance

May 2022

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Prepared for the National Urban Security Technology Office  
and the U.S. Department of Homeland Security



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## Glossary:

<b>Term</b>	<b>Definition</b>
ASTM	American Society for Testing and Materials
CDC	Center Disease Control
CRC	Community Reception Center
CRCPD	Conference of Radiation Control Program Directors
D+D	Decontamination and Demolition
DHS	Department of Homeland Security
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
Hazmat	hazardous material
Hot zone	Area that needs to be evacuated
IAEA	International Atomic Energy Agency
ICS	Incident Command System
JIC	Joint Information Center
mR/hr	milliRoetgen per hour
NCRP	National Council on Radiation Protection
NUSTL	National Urban Science and Technology Lab
OEM	Original Equipment Manufacturer
PIO	Public Information Officer
PNNL	Pacific Northwest National Lab
PPE	Personal Protection Equipment
RDD	Radiological Dispersal Device
Shelter-in-place	Area where people need to remain indoors, and take refuge
UC	Unified Command

## Summary

The goal of this After Action report is to utilize feedback from the pilot participants to improve the guidance for responding to radiological dispersal device (RDD) events, which can include deliberate acts to release radioactive materials into the environment using explosives or other means or accidental releases (e.g., release from a medical isotope source). This longer-term recovery guidance is an extension of the initial response guidance that was released in a 2017 interagency report called RDD Response Guidance: Planning for the First 100 Minutes (hereafter, the “First 100 Minutes”).

Recovery teams reviewed the longer-term recovery guidance during pilot sessions that were held in Harris County, Texas (March 8-10, 2022) and Seattle, Washington (May 2-3, 2022). The pilot teams reviewed the RDD Recovery Guidance Presentation, which contains a summary of the more detailed RDD Recovery Guidance draft document. Table 1 contains an overview of the different RDD guidance materials and Table 2 summarizes the pilot feedback for longer-term recovery guidance. The recovery teams included first responders (fire, law enforcement and emergency medical personnel), emergency management personnel, health physics professionals, public health specialists, public information officers (PIOs), and others.

The feedback from both pilots was grouped and binned into unique themes (e.g., “checkpoint challenges”) that align with the recovery missions and tactics that they reviewed (Table 2). PNNL authors of the recovery guidance then prepared responses that describe how they recommend addressing the feedback for each theme. The responses typically included recommendation plans for improving the guidance document, but also described when no changes are needed because the guidance already contains the suggested improvement. These pilot recommendations will be brought to the interagency team to finalize plans for updating and improving recovery guidance materials.

Table 1. Overview of the RDD response and recovery documents.

#	RDD Recovery Document	Recap
1	<i>RDD Response Guidance: Planning for the First 100 Minutes (2017)</i>	<ul style="list-style-type: none"> <li>• “First 100 Minutes”</li> <li>• Released in 2017 (NUSTL, DHS, FEMA, NNSA). Available at: <a href="https://www.dhs.gov/sites/default/files/publications/NUSTL_RDD-ResponsePlanningGuidance-Public_171215-508.pdf">https://www.dhs.gov/sites/default/files/publications/NUSTL_RDD-ResponsePlanningGuidance-Public_171215-508.pdf</a></li> <li>• Focused on initial actions in first 100 minutes:                             <ul style="list-style-type: none"> <li>○ Identify a radiological emergency has happened</li> <li>○ Rapidly survey spread of radiation</li> <li>○ Notify the public</li> <li>○ Begin conducting life-saving actions (e.g., evacuation)</li> </ul> </li> </ul>
2	<i>RDD Recovery Guidance Report (draft)</i>	<ul style="list-style-type: none"> <li>• Companion to the First 100 Minutes report</li> <li>• Draft report is being developed in 2022</li> <li>• NUSTL, PNNL, DHS, FEMA, EPA</li> <li>• Focuses on longer-term recovery actions that may take days, months, or even years</li> <li>• Table 2 contains a list of topics that are named tactics</li> </ul>
3	<i>RDD Recovery Guidance Presentation (draft)</i>	<ul style="list-style-type: none"> <li>• PowerPoint that closely matches the RDD Recovery Guidance Report</li> <li>• Reviewed at the Seattle and Harris County Pilots</li> <li>• Recommendations to the PowerPoint also apply to the report</li> </ul>

	<ul style="list-style-type: none"> <li>• Will be used for training purposes</li> </ul>
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Table 2. Topic categories that were used to bin pilot guidance into unique themes

Topic Category		# of Unique Themes
Overarching (multiple missions or tactics)		10
Mission 1: Characterize, Map, and Model	Tactic 1: Survey Radiological Hazards	5
	Tactic 2: Implement Radiation Exposure Mitigation	0
Mission 2: Communicate	Tactic 3: Communicate	6
Mission 3: Monitor and Assist	Tactic 4: Conduct Phased Evacuation	4
	Tactic 5: Provide Basic Needs	2
Mission 4: Restore the Environment	Tactic 6: Sustain the Area	1
	Tactic 7: Remediate	3
	Tactic 8: Manage and Dispose of Waste	2
Mission 5: Reopen and Rebuild	Tactic 9: Reopen	1
	Tactic 10: Rebuild	2
Pilot Slides: Housekeeping Updates		5
<i>First 100 Minutes Report*</i>		4

\* Not a focus of the pilot, but recommendations were collected since there are plans to update this report

## Topic Category: Overarching (multiple Missions or Tactics)

There were overarching comments and recommendations that applied to multiple missions or tactics. This section summarizes these overarching recommendations that were made by pilot participants and describes the proposed actions for updating the guidance materials in response.

### Theme O-1: Summarize key actions, partners, and leadership roles (ICS/JIC)

#### Feedback/Comments:

- The central issue is that many of the tactics occur in parallel (same time), which causes confusion and conflict if not mapped out well. There are a lot of operational actions that people need to do.
- I have concerns with your order (of presenting the missions and tactics) because people do step-by-step processes. There is a lot of overlap that will be happening.
- I like the idea of a master table/matrix of action items they (referring to those who will be taking actions) can print off and laminate.
- Include high-level guidance about leadership (UC/ICS and JICs) – especially radiological considerations.
- At a minimum, include a list of potential federal partners and radiation specialists that may be available to help. There are a lot of operational actions that people need to do that require coordination among local, federal, and state partners and specialists.
- Make it clear the timelines are not hard deadlines (in the First 100 Minutes and here). You will get lots of brushback from jurisdictions that these timelines are not feasible and that you're setting them up to fail.
- Highlights the need for "regional mutual aid" since smaller jurisdictions need to pool their regional resources and coordinate their incident response roles/responsibilities ahead of time.

#### Recommendation:

- Make the guidance more action oriented and consider a master table/matrix of key actions.

#### Response:

- Checklists would work better for Tactics 1-2 that are heavy on operation, but they are more difficult for later tactics that need more custom responses. In those instance, a framework could be suggested without being too prescriptive and continuing to recognize the unique and challenging nature of the event. Checklists at a high level may be useful where specific actions can be identified.
- The guidance was light on leadership because it was assumed that recovery teams already understand how to form and operate Unified Command/Incident Command System

(UC/ICS), and Joint Information Centers (JIC). Incident management can be added up front in the Introduction or briefly described in an annex.

- The introduction already covers the diverse technical experts that will be needed and each tactic recaps recommended planning partners.
- It is challenging to identify who would do what throughout the recovery process (e.g., federal vs. local), but we can try to expand upon this in the guidance without making the guidance too prescriptive.
- There will be federal help and subject matter experts available throughout the response and recovery.

#### **Proposed Action:**

NUSTL will create a summary (with PNNL support) that includes overarching leadership guidance and the parallel nature/timing of early tactics that includes:

- (1) Table/matrix of key actions
- (2) High-level recaps of UC/ICS and JICs – especially radiological considerations
- (3) Emphasize available partner federal agencies and specialist job families (e.g., health physicists) and contact information
- (4) Clarify that timelines are for guidance and not hard deadlines
- (5) Highlight the need for “regional mutual aid”

### **Theme O-2: Guidance Scales to Large or Small Events**

#### **Feedback/Comments:**

- It would be nice to first identify how large the explosion is because it will the stage for the challenges (e.g., a few sticks of dynamite or a large event like Oklahoma City).

#### **Recommendation:**

- Make it clear the guidance can scale to large and small events.

#### **Response:**

- The introduction specifies this guidance is supposed to provide a flexible framework for addressing any type of RDD event (e.g., a dirty bomb or accidental release).
- Jurisdictions are supposed to use the guidance to help write their own custom recovery plans and the guidance covers both large and small events.

#### **Proposed Action:**

- NUSTL will specify more in the introduction that RDD events can scale to large or small events and could include an example of a potential large and small event to help set the stage more.

### Theme O-3: Public Compliance Helps Conserve Resources

#### Feedback/Comments:

- It is helpful to have materials ahead of time for health, self-decontamination, evacuation instructions – these will help with the lack of first responders.
- Outreach (e.g., self-decontamination, evacuation, health measures) to the public to get them to help abide by protective actions can really help reduce strain on first responders.
- Trying to get the public to conform with protective actions will be a challenge due to misinformation, radiation fears, and mistrust.

#### Recommendation:

- Make it clear in Tactics 1, 2, 5, and 6 that Communicate (Tactic 3) contains instructions for public messaging (e.g., self-decontamination, evacuation, health measures) that are important to reduce strain on first responders, Community Reception Centers (CRCs), hospitals, etc.

#### Response:

- This theme is already covered in Tactic 3, but it could be further emphasized in other tactics that involve first responders and community reception/medical centers.

#### Proposed Action:

- NUSTL will clarify in Tactics 1,2, 5, and 6 that a high priority parallel action is public messaging including direction and instruction (e.g., self-decontamination, evacuation, health measures) to reduce strain on first responders/medical centers.
- This may be an action where a checklist that can be shared with the public in the event of an RDD is useful.

### Theme O-4: Volunteers Help Recovery

#### Feedback/Comments:

- Recruiting and training volunteers is an important overarching topic since limited resources will be a main challenge with RDD events, but there is not much guidance on this in the report.
- Just-in-time training provides information right when someone needs it and is focused on the job duties they will have to perform. It can be used to rapidly train recovery teams on radiation safety topics (e.g. PPE) and also teach volunteers to conduct important tasks (e.g., helping at CRCs or checkpoints).
- It would be helpful to include published finding on training volunteers for recovery assistance: Emery RJ, Sprau DD, Morecook RC, Herbold JR. [Surge capacity volunteer perspectives on a field training exercise specifically designed to emphasize likely roles during a disaster response](#). *Health Phys* 97(Suppl 3): S155-S160; 2009. [PMID: 19820470]

**Recommendation:**

- Include guidance on the need to recruit volunteers and provide just-in-time training.

**Response:**

- We agree with the recommendation about adding information regarding use of and training volunteers.

**Proposed Action:**

- NUSTL will make it clear there will be a need to recruit volunteers and provide just-in-time training in Tactics 4, 5, and 9.

**Theme O-5: Include Links to Other Recovery Guides****Feedback/Comments:**

- This plan is supposed to go across the national level and some jurisdictions may not understand the terms you mean (such as a CRC and hazmat/radiation jargon).
- Does your document provide background information and links to help people do things like set-up a CRC or conduct a checkpoint?

**Recommendation:**

- Use links to other recovery guides.

**Response:**

- The guidance document contains numerous links to background guides and other helpful resources.
- While the guidance does assume that readers have a basic understanding of general emergency response principles, important radiologically concepts are described in detail to help audiences that may not be familiar with it.

**Proposed Action:**

- No actions are needed since links to other recovery guides are already included.

**Theme O-6: Stress Mental Health Issues****Feedback/Comments:**

- Stress that long-term mental health issues associated with a RDD event could potentially dwarf the radiological health issues.
- Psychological impacts don't end with the evacuation. These people will be relocated and may never be allowed to come back. They are removed from their home, jobs, friends, family, their community, and cultural identify.

- Relocated people will also have to deal with bias and stigma from their new host communities and feel like outsiders.
- Although remediation planning should include an emphasis on areas that are more feasible to clean-up and including areas of economic importance, it is also important to consider areas that will improve mental health and restore community confidence.
- It is important to repeatedly stress that there will be many long-term and difficult hurdles to overcome over the course of recovery – it helps to establish credibility, set reasonable expectations, and improve mental health.

#### **Recommendation:**

- Mental health stresses will be a major issue for evacuation, relocation, and remediation goal setting and there are additional resources available to help address mental health of the public and the responder community. This topic should be added to the guidance.

#### **Response:**

- It is important to stress these cross-cutting mental health issues and the need for support systems. This is already briefly discussed in Tactic 5, but it would be beneficial to make it clear that mental health will be a considerable issue throughout the recovery process.
- Mental health treatment should be addressed in the overall healthcare guidance that we think should be added (comment O-9). This includes making sure that there are plans for taking care of mental health of people that have relocated to other areas, which would include a transfer from recovery teams to host communities.
- Mental health care for responders, remediation workers, and others directly involved in the response should be addressed in the guidance.
- There are resources for helping with mental health elements for radiation incidents (from the International Commission on Radiological Protection [ICRP] and others) that can be utilized:
  - Psychological First Aid in Radiation Disasters <https://www.orau.gov/rsb/pfaird/>.
  - <https://www.samhsa.gov/disaster-preparedness>
  - REMM – Radiation Emergency Medical Management (<https://remm.hhs.gov/>)
  - Psychological Issues for Radiation Emergencies: <https://remm.hhs.gov/psych.htm>

#### **Proposed Action:**

- NUSTL will summarize in the introduction that mental health will be a major issue throughout the recovery process (i.e., evacuation, relocation, remediation, reopening) and describe guidance and tools to help.
- NUSTL will stress throughout the document (i.e., introduction, evacuation, relocation, remediation, and reopening) that mental health will be a major issue and they will describe guidance and tools to help.

## Theme O-7: Recap Communications Needs in Each Tactic

### Feedback/Comments:

- Every tactic will have their own communication needs for both internal and external/public purposes. Maybe include a short call-out or recap of what these would be in each tactic.

### Recommendation:

- Consider discussing key communication needs in every tactic instead of just consolidating it all in Tactic 3.

### Response:

- Concur that Communications spans the complete recovery and guidance.

### Proposed Action:

- NUSTL will add a short recap of key communication needs in every mission or create an annex that summarizes them for quick access.

## Theme O-8: End-Game Vision Drives Earlier Goals

### Feedback/Comments:

- Establishing and communicating the end-game completes the overall picture of what your plans should be.
- Need to think about who should be allowed to return first and make sure they have the service support.

### Recommendation:

- In both Tactic 7 and 9, stress that it is important to consider the end-game when developing and prioritization plans for remediation and reopening

### Response:

- We agree with this recommendation that recovery plans should always have the end-game in mind.

### Proposed Action:

- No actions are needed since developing prioritization plans for remediation and reopening is already a focus of Tactics 7 and 9, respectively.

## Theme O-9: Need Hospital and Medical Guidance

### Feedback/Comments:

- Some patients will skip decontamination centers and will show up at hospital doors. Others will be decontaminated to reasonable levels but will remain above levels hospitals are comfortable. Hospitals may reject potentially contaminated patients due to concerns with having to close their ER, trauma centers, or the whole hospital.
- Hospitals could shut their doors and a need to set-up emergency alternative care centers may be necessary.
- CRCs can also help treat non-emergencies to prevent overload to emergency medical staff. Many people will present symptoms (e.g., vomiting) that can be due to stress instead of radiation sickness.
- First responders understand triage principles, but the challenges of dealing with large crowds of contaminated people is a concern and guidance would help.

#### **Recommendation:**

- Stress that hospitals may refuse to take contaminated patients inside and plans must be developed for treating medical emergencies of contaminated or potentially contaminated people ahead of time.

#### **Response:**

- Notification to hospitals and Emergency Medical Services (EMS) is covered in Tactic 3 of the First 100 Minutes guidance and is something that should be done early. The current guidance document does not address medical aspects at length and might need to incorporate such information as it pertains to the Radiation Injury Treatment Network (RITN) and how to coordinate.
- NCRP Report 161, Management of Persons Contaminated with Radionuclides, does provide some guidance on setting up the ER and/or trauma bays to receive and treat contaminated patients.

#### **Proposed Action:**

- PNNL will add medical guidance/resources in an annex or within the main guidance document that includes:
  - A need to plan outreach to the medical community to discuss this issue
  - Discuss resources that are currently available and others that would need to be rapidly obtained or disseminated with regional or federal help
  - Describe the plans and procedures for medical guidance that will be necessary during the event

Add medical guidance in an annex or main document. An annex is recommended but the call-out must be in the guidance.

### **Theme O-10: Do a Capability Assessment**

#### **Feedback/Comments:**

- Jurisdictions should use this guidance to perform a capabilities assessment right away. This will allow you to identify what the risks are, what gaps you have, and ways you can close these gaps (e.g., probing the local hospital).

**Recommendation:**

- Specify right away that each jurisdiction should perform a capabilities assessment with this guidance.

**Response:**

- Being specific that a jurisdiction should conduct a capability assessment as part of developing their recovery plans should be included in the guidance.

**Proposed Action:**

- NUSTL will stress in the introduction that this guidance is intended to help jurisdictions identify gaps, needs for partnerships, and map pathways forward.

## Mission 1: Characterize, Map, and Model

Mission 1 is characterize, map and model radiological hazards to establish the maximum extent of contamination spread, provide data for remediation activities, and determine the potential risk radiation poses to people and the environment within the contaminated area. There are 2 tactics included in this mission. There were no stand-alone feedback comments for Mission 1, but there were several that apply to this mission in the overarching and tactic sections. Those are addressed in the appropriate sections of this report.

## Tactic 1: Survey Radiological Hazards

### Theme T1-1: Top Priorities are Lifesaving and Wide-Scale Surveys

**Feedback/Comments:**

- Their main focus is saving people while mitigating the event. Lifesaving is clearly the main goal and effort in the first phase of the incident.
- Smaller jurisdictions may not have the resources for extensive radiological surveys or sample collection in the response and early recovery phases, so they will commit most resources to life saving and high priority data collection.
- Tactics 1.2 (collect samples and measurements for field/lab analysis) and 1.3 (risk assessment + near field survey) are going to be a low priority for them.
- There is some important information they should get right away, (e.g., absence of extensive alpha contamination and radionuclide ID), that are needed for initial risk assessments - but don't over push lower priority data gathering.

- Fire crews will be working right away to identify the blast zone, hot zone, and then map the plume via the 10-point or wide surveys with boots on the ground; however, there are limitations with these surveys due to canyon effect + swirling winds, so it's a top priority to request additional plume modeling (NARAC), radiological monitoring assets (RAP & CMHT) and aerial monitoring (AMS) capabilities from DOE early in the response and recovery efforts.

**Recommendation:**

- Specify that lifesaving operations and far-field radiological (wide-scale) surveys consistent with initial plume modeling are the highest priority actions for first responders right away in Tactics 1-2.

**Response:**

- Tactic 1 states that the wide-area surveys (using 10-point monitoring survey data and aerial surveys) are a top priority and that grid surveys are later-actions.

**Proposed Action:**

- NUSTL will further emphasize that lifesaving operations and aerial wide-scale surveys are top priorities in the introduction in Tactic 1.

**Theme T1-2: Crime Scene Evidence****Feedback/Comments:**

- This is a main concern for dirty bombs and suspected terrorist attacks.
- Include guidance about crime scene preservation and allowing FBI Special Agent Bomb Technicians (SABTs) and law enforcement (LE) to complete forensic exploitation at the release site. This probably should happen as early in the timeline as is possible depending on dose levels.
- An issue with using helicopters to conduct radiation surveys (if flown too low) is that the rotors will blow away debris and ruin the crime scene.

**Recommendation:**

- Specify that gathering crime scene evidence should be dealt with as soon as feasible in Tactic 1.

**Response:**

- Crime scene investigation is covered in Tactic 1 under detonation site assessment very briefly and without much guidance.
- There is almost no guidance for law enforcement in the current document.
- FBI Hazardous Evidence Response Teams will take control of the release site and conduct evidence recovery. How this fits into the current guidance is largely unaddressed.

**Proposed Action:**

NUSTL will provide more detail on crime scene guidance in T1:

- (1) NUSTL discussed reaching out to their FBI partners who helped with the First 100 Minutes
- (2) Build on the limited information in the First 100 minutes guidance to provide initial direction/preparations for this area around the detonation site.
  - IAEA resources that provide guidance for radiological crime scene management
  - <https://www-pub.iaea.org/MTCD/Publications/PDF/Pu1672web-85447671.pdf>  
Richard Pierson mentioned that there is a report that contains guidance for radiological events
- (3) There should be a Temporary Flight Restriction (TFR) above the scene.
  - Helicopters should not be flown above an RDD crime scene and coordinate with FAA to initiate a Temporary Flight Zone Restriction

**Theme T1-3: Hot Zone Thresholds****Feedback/Comments:**

- Clarify to the radiological response teams that 10 mR/hr is the hot zone dose rate threshold – and the 2 mR/hr threshold they commonly use is too low because it is the level for licensee occupational health.
- I think that NUSTL and the PNNL group should communicate this same issue to other rad responders throughout the country because they likely have similar confusion.

**Recommendation:**

- Clarify that 10 mR/hr is the hot zone dose rate threshold and not the lower 2 mR/hr threshold that licensees establish and control access to (that first responder teams will identify)

**Response:**

- Tactic 1 and the First 100 Minutes already specify that the initial hot zone (250 meters from the detonation site) should be expanded to include other areas with >10 mR/hr (0.1 mGy/hr)
- 10 mR/hr is well documented as the recommended Hot Zone boundary point in NCRP Commentary 19 (2005), NCRP Report 165 (2010), the CRCPD RDD recommendations (2006), and in ASTM Standard 2601 (2008 and 2015). It's also cited in several peer-reviewed scientific papers, beginning in about 2006.

**Proposed Action:**

- (1) NUSTL will further justify the hot zone threshold and rationale.

- (2) PNNL will include the applicable radiation threshold areas in the glossary to prevent confusion

#### Theme T1-4: Clarify What “Sample” Means

##### Feedback/Comments:

- It may be worth clarifying what you mean by “sample,” whether you mean to obtain a dose rate measurement at a point, or to collect a physical sample for analysis.
- A measurement could be taken by just about anyone (given how many detectors exist), and any environmental organization could collect a physical sample.

##### Recommendation:

- Clarify if “sample” means dose rate measurement or physical sample for analysis

##### Response:

The written guidance already defines ‘sample’.

##### Proposed Action:

- No action is needed because Tactic 1 clearly distinguishes that “surveys” are for dose rate measurement and “samples” are for collections of physical material or air.

#### Theme T1-5: Spread Prediction Models

##### Feedback/Comments:

- Models that predict the spread of radiation will help first responders identify where problem areas may occur so they can plan and adapt.
- The models wouldn’t be limited to the plume, but would include other types of spread (e.g., roadways where spread from car tires can be significant).

##### Recommendation:

- Discuss if there are models that can predict contamination spread.

##### Response:

- The guidance already discusses that surveys and dispersion models will be used to identify and predict potential for contamination spread in Tactic 1.

##### Proposed Action:

- NUSTL will discuss that vehicle tires and other methods of contamination spread (foot traffic, animal movements, etc.) could be a source of contamination spread to be aware of and to mitigate against in Activity 2.4 (Mitigate Spread of Contamination).

## Tactic 2: Implement Radiation Exposure Mitigation

There were no stand-alone Tactic 2 recommendations. Many are covered in overarching comments.

## Mission 2 & Tactic 3: Communicate

Mission 2 is about communicating radiation exposure risks to the public and first responders, to give them the information they need to protect themselves, their families, and community, enabling long-term recovery and reoccupation. There is one tactic in this mission.

### Theme T3-1: RadResponder PIO Library

#### Feedback/Comments:

- The RadResponder's PIO Library also contains similar materials (videos, fact sheets, messaging) that are discussed in your Communicate Annex (<https://www.radresponder.net/#resources/library?rltf=104>)

#### Recommendation:

- Include RadResponder's PIO Library in list of Communicate Resources.

#### Response:

- We agree that it should be added to the communicate annex.

#### Proposed Action:

- NUSTL will add RadResponders PIO Library to the Communicate Annex

### Theme T3-2: Technical Milestones Drive Messaging

#### Feedback/Comments:

- From a planning perspective, lay out the contingencies for when messaging becomes available. We can't say "do this or that" until we know Y or we have Z data.
- Make it very clear from the science and data perspective, what is the limiting factor? For example, do we need to know what the isotopes are?
- What helps us shift from one phase to another is the availability of information. Know who we should be coordinating with at each phase. Clarifying this technical expert can help understand X.

#### Recommendation:

- Make it clear that need that technical milestones drive when and how public messaging can be delivered.

**Response:**

- Activity 3.1 in Tactic 3 specifies that radiation experts should be brought into the messaging development process early on for this reason.
- Tactic 1 also specifies the approach for establishing the initial evacuation and shelter-in-place zones and also the dose limits used to expand them as data becomes available. (In addition, specific direction on messaging is also included within the First 100 Minutes guidance.)

**Proposed Action:**

- No Actions are needed since the guidance stresses that technical milestones will drive messaging.

**Theme T3-3: JIC Best Practices**

There were numerous comments about JIC best practices that are summarized in

Table 3, which also contains responses and proposed actions.

**Table 3. List of JIC best practice recommendations and response and proposed action.**

#	Recommendation	Response and Proposed Action
1	List the likely federal partner agencies so can coordinate PIOs	See comment #O-1 about creating a summary that identifies federal partners that will be in ICS and JICs
2	Discuss merits to virtual JICs to link experts from throughout country	The guidance already states that webinars are effective for this same reason.
3	Describe the technical specialists that guide when messages / next steps can be taken	This is already covered in the introduction of communication.
4	Communication experts should identify the communication tools (in diverse languages) ahead of time	This is already stressed in the communicate introduction and annex.
5	Crisis communicators should take radiation trainings that cover the above	<p>Action: NUSTL will briefly mention in Tactic 3 that it is important to for PIOs to take communication trainings for radiological events.</p> <p>PNNL will add a "Training" category to the Communicate annex and include this course: <a href="https://www.cdc.gov/nceh/radiation/emergencies/cerc.htm">https://www.cdc.gov/nceh/radiation/emergencies/cerc.htm</a></p>
6	Use a hotline to broadcast information	Action: Add hotlines to Table 3.3
7	Make it clear that communication needs to be timely, accurate, and actionable	The points are already stressed in communicate

8	There needs to be additional communications with elected officials early and often.	<u>Action: add elected officials to Table 3.3</u>
9	Emphasize communicating the “re-entry strategy” to help alleviate concerns when people return	It would be beneficial to add more guidance about re-entry communications.  <u>Action: NUSTL will add discussion of risk communication and providing public assurance of safety to Table 3.3 under “Long-term recovery and re-occupancy”</u>
10	Emphasize need for continual coordinated communication between leadership (UC/JIC,ICS, and external partners).	This is already a main theme in the introduction of Communicate for all recovery phases. It could also be covered in the proposed leadership summary (see Theme O-1).

**Recommendation: Provide a high-level overview of JIC best practices.**

**Theme T3-4: COVID Communication Lessons Learned**

**Feedback/Comments:**

- Stress that misinformation has been a big hinderance from COVID response and need to be ready to counter myths/misinformation, have a dedicated trusted spokesperson, and pair experts with elected officials
- Misinformation and non-compliance with protective COVID actions were common
- Whether or not this is a real emergency or not, social media will blow up and cause this to be a mass hysteria event. What we learned from COVID is that your data driven public response plans get shot by bad messaging and misinformation.
- You need to be the trusted source, have your messaging ready for ASAP delivery, be data driven, and be ready to counter myths and misinformation.

**Recommendation:**

- Use lessons learned from COVID communication and stress that misinformation has been a big hinderance from COVID response.

**Response:**

- Communicate emphasizes the same issues that will likely occur with RDD events
- The “Trusted Source” provides an approach to dealing with government distrust and misinformation, but it could be helpful to use a case study.

**Proposed Action:**

- NUSTL will decide to if a “COVID lessons learned” case study should be added to Tactic 3 or not. Eliot stated we might want to have a covid lessons learned, but we believe a COVID

case study is likely inappropriate for an RDD incident. For a RDD incident people will need to be checked for contamination and there will be a denial of access to a geographic area until decontamination and recovery is complete. These are not a concern for COVID. We do agree that accurate, timely, actionable communication is key for an RDD incident and such lessons from COVID would be appropriate.

### Theme T3-5: Evacuation + Shelter-in-Place Communications

#### Feedback/Comments:

- Mass evacuations are going to considerably strain first responder, medical, and law enforcement resources. Convincing people to abide by evacuation orders and shelter-in-place guidance will be an important, but difficult challenge.
- Need to let the public know they are safe and will be taken care of. Here is why it is safe to shelter-in-place and here are ways to decontaminate yourself, family, and pets.
- Let them know we will keep the power on for them, that safe food and water will be available, we will also provide health care and mental support, your friends and family will be fine, and your main focus is taking care of you.

#### Recommendation:

- Stress the benefits and challenges of sheltering-in-place

#### Response:

- Tactic 3 stresses that getting the public to comply with protective actions, including sheltering-in-place, is essential and will be the main challenge for the same reasons identified at the pilot.
- The communicate annex also provides tools for helping assure the public that it is safe (e.g., video on countering radiation myths) and highlights self-protection guides.

#### Proposed Action:

- NUSTL will add a sentence or two in Tactics 3-5 to stress that it is important to provide periodic assurance to let the public know that they are safe and will be taken care of. This where the trusted spokesperson is very important.

### Theme T3-6: Communicating Unpopular Decisions

#### Feedback/Comments:

- For example, not ever being able to reopen a heavily contaminated site or that waste will need to be stored inside the city for a while.
- We deal with unpopular decisions all the time. Asking people to leave and nothing happens is unpopular. Or not having them leave and something bad happens.

- It is critical that you let the public know the reasons why you made your decisions in a transparent process and that you used experts to make the most accurate decisions to help save people.
- You will always be critiqued post-decision, so it is important to let the public know that you don't have many choices and you are doing the best you can.

#### **Recommendation:**

- Add a communicate section on dealing with unpopular decisions

#### **Response:**

- Adding a communication section for dealing with unpopular decisions would be helpful. This could be expanded to cover difficult questions that are covered in the annex.
- The Tactic 7 discussion addresses “unpopular decisions” about how decisions with remediation may be iterative because initial decisions may not meet stakeholders’ expectations.

#### **Proposed Action:**

- NUSTL will specify in the Communicate annex that the messaging guides that are showcased also include many FAQs for difficult questions and unpopular decisions.
- Add a section in the communicate annex to highlight existing tools, decision-making criteria, and communication approaches for tough questions and unpopular decisions.

## **Mission 3: Monitor and Assist**

Mission 3 is monitor and assist affected populations to reduce their radiation exposure and enable continuity of disaster services amid a contaminating incident. There are two tactics in this mission. There were no stand-alone Mission 3 recommendations, but there were several that apply to this mission in the overarching and tactic sections.

## **Tactic 4: Conduct Phased Evacuation**

### **Theme T4-1: Checkpoint Challenges**

#### **Feedback/Comments:**

- Benefits and challenges of using checkpoints or central meeting locations was a main area of discussion at the pilots as summarized below.

#### The issues with checkpoints in a major RDD event could include:

- (1) They will considerably strain your security + decontamination staff/resources
- (2) You will get fewer staff than you expect due to radiation fears (30% might refuse)
- (3) You will likely have to make sacrifices – modeling, field, CRC?
- (4) Tensions will be very high (health concerns and having to seize personal property)

(5) Creating bottlenecks that prevent people from rapidly exiting contaminated areas

Rationale for central meeting locations:

- Accomplish same purpose as checkpoints (e.g., decontamination), but the main benefit is they allow you to pool resources and expediate evacuation.
- Smaller jurisdictions may not have enough resources for checkpoints

Rationale for checkpoints:

- Checkpoints limit and control spread of contamination by making people and vehicles stop at exit points
- Larger jurisdictions have the resources to be able to set-up checkpoints within hours for large events and would use a tiered response until enough officers can be brought in.
- If we have large quantities of contaminated people – is it the best strategy to congregate them all together? Central meeting locations could have more mixing of contaminated and non-contaminated people.

**Recommendation:**

- Checkpoints are hard and resource intensive. Consider removing them and instead use central meeting locations.

**Response:**

- We agree with this recommendation to a point.
- Central meeting locations are a good idea as they would allow for the simple sharing of information with the public, gross decontamination to begin, triage of the wounded / contaminated, and the start of an orderly evacuation.
- Checkpoints will still be necessary as not all people will go to the meeting location, some will ignore orders to leave items behind or surrender them, etc.

**Proposed Action:**

- NUSTL will describe the benefits and challenges for checkpoints vs. central meeting locations. For resource limited jurisdictions, NUSTL will provide guidance about choosing the best option.
- If shelter-in-place is effective, then can manage checkpoints in accordance with resources available, i.e. if it is a phased evacuation. This can be added to text.

## **Theme T4-2: Transportation Vehicles**

**Feedback/Comments:**

- Concerns with ambulances include spreading contamination from patient to patient, and also fears from the driver and emergency medical staff.

- The CTOS training specifies that you may not be able to decontaminate people if there are medical emergencies. So if transport a person because their life concerns are greater than spread, then that vehicle is now considered contaminated. But that vehicle can keep being used over and over for other contaminated people. We train on medical transport.

**Recommendation:**

- Discuss concerns with ambulances and other medical transport vehicles that could be used to move contaminated patients and evacuees.

**Response:**

There is already considerable guidance regarding transportation and ambulances:

- (1) it will be a considerable challenge for mass evacuation events;
- (2) people will attempt to flee with personal vehicles that may cause bottlenecks and may need to be seized at checkpoints;
- (3) mass transportation should be used, when available and population density is high to shuttle passengers with screening;
- (4) need to consider people may have mobility or language barriers;
- (5) since there will a need to transport injured people that are contaminated, reuse the same contaminated vehicles for this.

**Proposed Action:**

- NUSTL will recap these main points regarding ambulance and transportation in the proposed new medical guidance section or an annex (see theme #O-9).

### Theme T4-3: Weather Hazards

**Feedback/Comments:**

- Hazardous weather conditions like searing heat are an important safety consideration. You need to shift gears and make plans to get people out of hazardous environments as soon as possible.

**Recommendation:**

- Discuss that weather hazards are important to consider during evacuation, shelter-in-place, and at checkpoints

**Response:**

- Weather hazards are a critical safety issue that could be expanded upon in the guidance (e.g., shade and water on hot days or heating for cold or raining days).

**Proposed Action:**

- No action is needed because weather hazards are discussed in Tactic 3.

## Theme T4-4: Contaminated Corpses

### Feedback/Comments:

- This will be an issue that medical examiners and first responders will have to address. Is there guidance about contaminated corpses (e.g., transportation, funerals, disposition of the body)?

### Recommendation:

- Provide guidance on dealing with contaminated corpses

### Response:

- There is CDC guidance that is aimed at medical examiners, morgues, and mortuary staff. NCRP also addresses it in Report 161.

### Proposed Action:

- NUSTL will include guidance on contaminated corpses in either Tactic 4 or 5.

## Tactic 5: Provide Basic Needs

### Theme T5-1: Relocation issues and solutions

#### Feedback/Comments:

- There was considerable discussion about relocation issues and solutions that are summarized below.

#### Issues with relocation include:

- (1) Shelters are meant to be temporary, but they can last for over a month in non-radiological incidents (e.g., hurricanes). They may need to last even longer for radiation events.
- (2) The Red Cross will stress that it is important to limit the amount of time people spend in CRCs and shelters because it will take a toll on their mental and physical health. Shelter operations can often have to deal with over 20,000 people and there is limited means for sanitation, privacy, and personal hygiene.
- (3) Many areas will have minor contamination well below PAG levels and negligible health concerns. Getting people to return to these areas can help restore communities and alleviate mental health concerns. However, it will be a difficult challenge and a large lift to convince them it's okay to return.
- (4) There are considerable mental health issues with removing people from their community (home, jobs, friends, family) and having them move elsewhere.

#### Guidance and solutions for relocation include:

- (1) Communicate with people evacuating that this is likely a relocation not an evacuation. Relocation needs to be stressed.
- (2) Emphasize that jurisdictions need to have something set up quickly to accommodate people for long term housing.

- (3) Emphasize that reception centers are short-term (not long term) and will refer/facilitate connection to other services that can provide interim housing.

**Recommendation:**

- Discuss relocation issues and guidance

**Response:**

- Tactic 5 does provide guidance on relocation issues (e.g., important to also have mental health specialists available), but this guidance was brief because it was assumed that recovery planners are already aware of these issues.
- The pilot audience specified that larger jurisdictions may be aware of relocation issues and understand how to respond to them, but smaller jurisdictions may not.

**Proposed Actions:**

- (1) NUSTL will recap these relocation issues and guidance in Tactic 5.
- (2) NUSTL will consider including lessons learned from Fukushima shelters.

**Theme T5-2: Food & Water Safety Assurances**

- There were several recommendations about food and water safety assurances (Table 4). In addition, the importance of these reassurances to public safety directly align with Theme T3-5 above.

Table 4. Food and water safety recommendations and responses and proposed actions.

#	Food and Water Recommendations	Response and Proposed Actions
1	Stress that long-term water quality testing is needed for human safety and public trust.	These are already main themes in Tactic 5.
2	Need to monitor contamination of wastewater (e.g., sewers) to minimize spread to the environment	This is already a main theme in Tactic 5.
3	Discuss that a main issue will be food safety concerns and include high-level guidance for it. The public will be concerned the food and water is unsafe even if it is trucked in from safe areas.	Food safety concerns and need for public messaging are already described in Tactic 5.  <u>Action: NUSTL will bolster food safety section with:</u> (1) Derived Intervention levels (DILs) from FDA set standards for radioactivity in food (2) Describe the many existing federal resources and tools for food safety (e.g., NRC) (3) Experts will be there to help (HPs for food + PIOs for communication)

4	Add that food services and logistics needs to be planned for.	This is already a main theme in Tactic 1 and it will be added to the presentation slides.
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## Mission 4: Restore the Environment

Mission 4 is restore the environment by reducing and removing radioactive hazards to the public, including radiological waste generated by the incident and clean-up. There are three tactics in this mission. There were no stand-alone Mission 4 recommendations, but there were several that apply to this mission in the overarching and tactic sections.

## Tactic 6: Sustain the Area

### Theme T6-1: Remove the Tactic and Shorten to a Recap of Radiation Guidance

#### Feedback/Comments:

- Sustaining an area isn't a new, unique, or unfamiliar issue in national disaster responses. There will be unique radiological challenges to be aware of (e.g., PPE and dose limits for recovery workers)
- Instead of having a stand-alone tactic, it could be shortened to a high-level "things to think about" because it is an OEM/EOC long-term consideration

#### Recommendation:

- Consider removing the tactic and shortening to high-level recap of "radiological things to think about."

#### Response:

- A high-level summary of special radiation considerations for area sustainment has merit

#### Proposed Action:

- NUSTL will remove Tactic 6 and summarize high-level radiation guidance for area sustainment in Tactic 5 since that has the best fit (e.g., maintaining a power plant fits with basic needs). Consider moving the high-level "things to think about" in a radioactively contaminated area to an annex.

## Tactic 7: Remediate

### Theme T7-1: EPA Rad Decontamination Query Tool

#### Feedback/Comments:

- The EPA Radiation Decontamination Query Tool should be included because it provides information about removing radioactive contamination from a variety of building materials

**Recommendation:**

- Make sure the EPA's Radiation Decontamination Query Tool is included in Remediate and/or the Decontamination and Demolition (D+D) annex.

**Response:**

- Agree that this tool should be added to the resources available for recovery from and RDD.

**Proposed Action:**

- NUSTL will add this information to Tactic 7 and PNNL will add the EPA Radiation Decontamination Query tool to the resources for both the remediate and the Decontamination and Demolition (D+D) annex.

**Theme T7-2: The New Normal****Feedback/Comments:**

- Elected officials and the public will always want to know when we can go back to normal.
- It is important to stress that there will be a "new normal" with many hardships and long-term recovery operations, which will include areas that cannot be reopened. Being open and transparent will help set reasonable expectations with the public and help with trust.

**Recommendation:**

- Stress that this will be a long-term recovery process that could take many years and that some areas may not be restored or returned to their prior state or use.

**Response:**

- Recognizing a new normal may exist is important for planning for recovery from an RDD

**Proposed Action:**

- No action is needed since the "new normal" theme is covered in Tactics 7 and 9.

**Theme T7-3: Remediation Contractors****Feedback/Comments:**

- Special contractors are used to handle waste clean-up (e.g., asbestos in a mall fire) in large emergency incidents, but they might not have the qualifications for radiation clean-up.
- Stress that it is important, before the incident, to identify contractors that are qualified to clean-up radiation waste.
- It is also important to ensure these contractors are eligible for reimbursement by the government. Have seen several times that a contractor is hired by a friend of a friend, and

they aren't eligible. Need to pre-identify these contractors so you know who to call in the event of an incident.

**Recommendation:**

- Identify remediation contractors that have the necessary qualifications and are eligible for government reimbursement before the incident.

**Response:**

- The guidance already contains a recommendation to identify contractors that are licensed to work with radioactive materials ahead of time.

**Proposed Action:**

- NUSTL will specify that remediation contractors must also be eligible for government reimbursement.

## Tactic 8: Manage and Dispose of Waste

### Theme T8-1: Difficulty Finding Rad Waste Sites

**Feedback/Comments:**

- There are only a few options for low level waste (LLW) throughout the country. Sites that are currently accepting waste may not be able to handle the high amounts of waste that would be produced from a RDD event.

**Recommendation:**

- Stress that finding a site that is willing to accept radiological waste materials will be a major challenge and existing waste partners may be unwilling to accept large amounts of new waste.

**Response:**

- We agree with this recommendation.

**Proposed Action:**

- No action is needed because lack of waste disposal sites has been identified as a major challenge in Tactic 8 and clean-up actions will probably need to identify interim waste sites near the incident until long-term disposal sites can be identified.

### Theme T8-2: Incorporate Other Waste Guides

**Feedback/Comments:**

- There are other helpful waste management guides to include:

- Radioactive Waste Disposal: An Environmental Perspective (EPA 402-R-94-001). Available at: <https://www.epa.gov/radiation/radioactive-waste-disposal-environmental-perspective> Radioactive Waste Disposal: An Environmental Perspective | US EPA
- *Radiation Site Cleanup Regulations: Technical Support Document For The Development Of Radionuclide Cleanup Levels For Soil* (EPA 402-R-96-011 A), available at: [https://www.epa.gov/sites/default/files/2015-05/documents/402-r-96-011a\\_intro.pdf](https://www.epa.gov/sites/default/files/2015-05/documents/402-r-96-011a_intro.pdf)

#### **Recommendation:**

- Include these additional waste management guides and update the guidance if there are any new concepts.

#### **Response:**

- These are useful guides to add to the report.

#### **Proposed Action:**

- NUSTL will update Tactic 8 with the first guide (Radioactive Waste Disposal: An Environmental Perspective)
- NUSTL will update Tactic 7 with the second guide (Radiation Site Cleanup Regulations: Technical Support Document For The Development Of Radionuclide Cleanup Levels For Soil).

## **Mission 5: Reopen and Rebuild**

Mission 5 is reopen and rebuild impacted areas to enable public reoccupation and use and equitable rehabilitation of communities. There are two tactics with this mission. There were no stand-alone Mission 5 recommendations, but there were several that apply to this mission in the overarching and tactic sections.

## **Tactic 9: Reopen**

### **Theme T9-1: Building Upon Prior Public Discussions**

#### **Feedback/Comments:**

- Start normalizing these radiation and recovery talks early and often because you will need to build upon these community engagement connections.
- When you get to rebuilding and recovery, then you can build upon the public's earlier concerns and feedback.
- Whatever is established in Tactic 3, start building upon that. For example, how do you talk with the public about having focus groups and building relationships.

#### **Recommendation:**

- In Tactics 9 and 10, stress they need to build upon the “public’s radiation discussions” and community connections that began earlier.

**Response:**

- Concur that building upon prior communications and discussions will help in public relations.

**Proposed Action:**

- NUSTL will update the guidance to stress that when it comes to reopening and rebuilding, that it is important to build upon prior discussions with the public and connect this focus with the ongoing Communications tactic.

## **T10: Rebuild**

### **Theme T10-1: Other Recovery funds**

**Feedback/Comments:**

- In your table that lists sources of financial aid, I assume other funding sources would come like community block grant and FEMA restoration funds, which are already on the books.

**Recommendation:**

- Confirm if community block grant and FEMA restoration funds can be used right now and specify that Congress would likely pass special appropriations too.

**Response:**

- We agree with this recommendation.

**Proposed Action:**

- NUSTL will further investigate and update the guidance accordingly. Ken Fickes, Director of Harris County Transit Services, will gather and share more information about this topic. Eliot Calhoun will consult with FEMA

### **Theme T10-2: Special Federal and State Disaster Funds**

**Feedback/Comments:**

- This would also be a big new incident for the USA, so expect that Congress and the states would likely pass special appropriations to help out.
- In an incident of this magnitude, there will be a declaration of disaster by the state and they will provide guidance and resources (e.g., funds for remediation workers). Include a note that locals should contact their state for additional state-specific guidance.

**Recommendation:**

- State there will likely be special recovery funds passed by Congress and the states.

**Response:**

- Agree that special government assistance will become available since that commonly occurs for other types of disasters.

**Proposed Action:**

- NUSTL will incorporate information about special federal and state disaster funds in Tactic 10.

## Pilot Slides (Housekeeping)

This section contains housekeeping edits for the presentation. The recommendations in Table 5 are important to resolve because the presentation will also be used as a future training guide.

Table 5. Recommendations and responses for the presentation slides that were used at the pilot and will be the basis for training materials.

#	Recommendation	Response and Proposed Actions
1	Add food services to slide 89	<u>Action:</u> PNNL will make this change.
2	Make it clear the scenario is not in the guidance and was just in the pilot slides to make the event related	<u>Action:</u> PNNL will use a generic scenario in the presentation for the version that will be used for trainings.
3	On the Gantt chart to start the presentation on Tactic 7, 7.1 (hire remediation contractors) is hours to days, but needs to be extended to days to months	<u>Action:</u> PNNL will fix these
4	On the Gantt chart to start the presentation on Tactic 8, 8.1 (establish waste volume and mgmt. goals) should be moved up to hours	
5	Slide 108: the second time "on-site" is mentioned should be changed to "off-site"	
6	Slide 108: Tactic 8 title needs to be updated to "Tactic 8: Manage + Dispose of Waste"	

## First 100 Minutes Report

The First 100 Minutes was not the focus of the Harris County and Seattle pilots, but the pilot participants provided some recommendations for future updates (

Table 6).

Table 6. Recommendations that also apply to the First 100 Minutes.

<b>Recommendation #:</b>	<b>Connection to First 100 Minutes</b>
O-1: Summarize key actions, partners, and leadership roles (ICS/JIC)	The pilot participants expressed concerns they would not be able to finish the First 100 Minutes actions on time. To prevent brushback, specify that these are not hard limits, but rather main actions to complete ASAP.
T1-3: Hot Zone Thresholds	Concerns were raised that the radiation responders are unaware that 10 mR/hr is the hot zone number of concern and not the lower 2 mR/hr threshold for licensees that radiation teams use. While the First 100 minutes does cover this, consider conducting outreach to let more people know.
O9-10: Need Hospital and Medical Guidance	First 100 Minutes does provide medical guidance (e.g., triage need), but it is also important to emphasize the issue that hospitals may close their doors to prevent contamination spread.

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