

**Report on Waste Disposal Workshops for a
Radiological Dispersal Device (RDD) Attack in an Urban Area - 11543**

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ABSTRACT

As the United States Government lead agency for decontamination response activities after chemical, biological, and radiological (CBR) incidents, the United States Environmental Protection Agency (EPA) has identified a number of critical gaps in the nation's collective preparedness. For an event such as a radiological dispersal device (RDD) incident in an urban area, waste management/disposal is one of the preparedness and response issues identified by EPA. The disposal of waste following such an incident would be a critical component of the overall response and recovery timeline and would require an extraordinary level of effort on the part of the public and private sector stakeholders. Waste volumes could potentially be significantly larger than typical volumes of low-level radioactive waste (LLRW) generated annually in the United States by the public and private sectors combined.

EPA organized a series of workshops to specifically address waste disposal demands resulting from an RDD incident. These workshops leveraged planning efforts for EPA's Liberty RadEx exercise held in April 2010 in Philadelphia, PA. Discussions were focused on a number of broad areas, including waste disposition jurisdiction and capacity, science and technology, communications, response pre-planning, and regulatory issues. Following the discussions, each participant identified priorities for EPA to pursue.

EPA is evaluating the workshop discussions and the priorities identified by participants in conjunction with the results of Liberty RadEx to help determine future activities to close or shrink the gaps. Some of these activities are already underway. EPA is also assessing opportunities to hold similar workshops addressing disposal issues for threat agents of concern.

INTRODUCTION

The National Response Framework (NRF) developed under the auspices of the Department of Homeland Security (DHS) presents the guiding principles that enable all response partners to prepare for and provide a unified response to disasters and emergencies.[1] The NRF establishes an all-hazards approach to domestic incident response that can be applied to incidents of any size, whether natural or caused by human action. The NRF also addresses the implementation of these principles by governments at all levels, as well as by nongovernmental and private-sector organizations and local communities. The NRF identifies fifteen Emergency Support Functions (ESFs), which provide the structure for coordinating Federal interagency support for a Federal

response to an incident. The ESFs provide a mechanism for grouping functions commonly used to provide Federal support to States and other Federal agencies. EPA is identified as a coordinating and primary agency for the implementation of ESF #10, oil and hazardous materials response, which includes short- and long-term cleanup and recovery activities.

Managing the waste resulting from a disaster or incident is a significant part of EPA's ESF-10 responsibilities. Situations as disparate as the 2001 destruction of the World Trade Center, the subsequent anthrax attacks in Washington, D.C. and elsewhere, Hurricane Katrina in 2005, and the British Petroleum (BP) oil spill in 2010 illustrate the challenges of planning an overall waste management response that can be applied to incidents representing a wide range of sizes and descriptions. The fact that relatively few exercises address scenarios beyond the initial emergency phase of the response (i.e., a few days after the event takes place) presents an additional challenge for those responsible for planning the intermediate- and long-term response.[2]

To address this challenge, EPA convened an internal group to examine the long-term implications of the scenario used in the fourth in a series of Top Officials (TOPOFF) national-level exercises. TOPOFF4, held in October 2007, postulated simultaneous detonation of Radiological Dispersal Devices (RDDs) in Portland, OR, Phoenix, AZ, and Guam.[3] The EPA group concluded that waste management represented a significant knowledge and policy gap that should be explored more deeply to identify available options and potential actions that could be taken to improve preparedness.[4, 5]

EPA's Office of Homeland Security (OHS) established a working group in July 2008 to identify barriers to disposal of waste resulting from incidents involving chemical, biological, and radiological agents, and to develop recommendations to address those barriers. In addition to OHS, the Threat Agent Disposal (TAD) workgroup included representatives from the Offices of Resource Conservation and Recovery, Emergency Management, Radiation and Indoor Air, Research and Development, Water, and Enforcement and Compliance Assurance, as well as EPA regional offices. The TAD workgroup categorized barriers to treatment or disposal as regulatory/statutory, policy/guidance, technical/scientific, socio-political, or capacity/capability, and evaluated their applicability to different combinations of waste types and threat agents. The TAD workgroup framed its analysis around the deliberate wide-scale distribution of a limited number of substances, and did not address more complicated release scenarios, such as transportation accidents resulting in the release of higher-activity transuranic radioactive waste or spent nuclear fuel. The Transportation Emergency Preparedness Program operated by the Department of Energy (DOE) has developed planning and exercise tools targeted to these types of incidents, which in some cases may translate to an RDD-type situation.[6] The TAD workgroup provided final recommendations to EPA senior management in 2009.

During the summer of 2009, EPA officials, including some members of the TAD workgroup, were preparing to participate in a workshop planned as part of the Interagency Biological Restoration Demonstration (IBRD). IBRD is a joint DHS-Department of Defense (DOD) activity with the goal of improving recovery and restoration following a biological incident.[7] The October 2009 workshop was held to examine issues related to the management of waste following an anthrax incident presumed to occur in Seattle, WA. The workshop included

stakeholders from Federal, State, and local governments, as well as the private sector waste management industry.[8]

EPA came to view this workshop as a potential model that could be applied to any threat agent. In late August 2009, the TAD workgroup began to plan a similar workshop focused on RDD waste management issues. This effort was particularly timely because it coincided with preparation for the EPA-led Liberty RadEx National Level Exercise, which was subsequently held in April 2010 in Philadelphia.[9] Liberty RadEx was specifically designed to exercise EPA's ESF-10 responsibilities, including waste management, in the aftermath of an RDD incident, and the exercise players were likely to encounter many of the barriers the TAD workgroup had identified. Considering this opportunity to frame the workshops around the exercise scenario, EPA characterized the overall objectives for the workshops as:

- Understand the current state of preparedness (including roles and responsibilities) in waste management and disposal in the case of a RDD urban incident
- Identify the issues and barriers of transportation, treatment, and disposal of RDD waste (short- and long-term) and priorities for addressing those issues
- Develop a template for a City of Philadelphia waste management plan in case of a RDD urban incident
- Provide valuable information on waste management issues for the Liberty RadEx.

In addition, because several members of the TAD workgroup were also involved in planning the waste management activities for Liberty RadEx, a good level of knowledge transfer already existed. From the early stages, then, the TAD workgroup coordinated workshop planning efforts with the Liberty RadEx lead planners.

WORKSHOP PLANNING

While the TAD workshop was not officially part of the Liberty RadEx preparation, organizers of both the workshop and the exercise hoped to use observations and insights from the workshop to inform the waste management play during the exercise. For this reason, and because the final stages of planning for the exercise would become extremely intense over the last few months, the workshop was scheduled for November 17-18, 2009 in Philadelphia. These dates were considered to be the overall best timing for the event, although selecting these dates tightened the planning window considerably and resulted in some important parties being unable to participate (in particular, the Pennsylvania Bureau of Radiation Control was completely occupied that same week with a Nuclear Regulatory Commission (NRC) program review and another exercise at Three Mile Island).

Building on the IBRD example, the proposed format of the workshop involved three half-day sessions, each involving a specific stakeholder group: 1) private sector, focusing on nuclear industry service providers (e.g., waste treatment and disposal, decommissioning and cleanup, measurement and survey technology), although many of the organizations contacted also had extensive experience in managing chemically hazardous waste; 2) State and local government; and 3) Federal government. It was thought to be particularly important for private sector participants to feel free to speak openly and unhindered by concern that their statements might

lead to regulatory action. Ideally, each session would involve about a dozen participants, not including those EPA personnel present during all sessions. EPA personnel were expected to serve mainly as observers during the first two sessions, providing input when requested by the participants. Members of the TAD workgroup identified potential participants from these groups through personal contacts, other program contacts, or by approaching organizations such as the Low-Level Radioactive Waste Forum, the Conference of Radiation Control Program Directors, or the Association of State and Territorial Solid Waste Management Officials. Liberty RadEx planners were also able to use contacts developed during the planning process to approach officials from the City of Philadelphia on behalf of the TAD workgroup.

EPA contractors conducted telephone interviews with the identified contacts, using a series of questions adapted from the IBRD process. These questions generally addressed topics such as organizational roles and responsibilities in the event of an RDD incident, the extent of planning and risk communications development to address such incidents, coordination and agreements with other organizations, and challenges to treatment and disposal of RDD-derived waste, such as available capacity and the willingness of communities to accept the waste. Approximately 65 people were contacted and about 50 people were interviewed (multiple contacts were initially identified from some organizations; organizations generally preferred to be represented by a single point of contact). Interview responses from the individual groups were analyzed to extract recurring themes and synthesize key questions for discussion at the workshops. In general, while the areas of emphasis were somewhat different among the groups, responses largely fell within a few broad areas, including:

- Regulatory restrictions/agreements/exceptions
 - Are necessary agreements in place to expedite waste handling?
 - Can disposal in non-radiological waste facilities be considered?
 - What is the response framework?
 - Who is in charge and what do they expect from the private sector?
- Scientific/technological
 - What is an acceptable cleanup level for free release of sites or material?
 - How will appropriate decontamination technologies be deployed?
 - What is an acceptable level of contamination for alternate disposal in solid or hazardous waste landfills?
- Waste disposition jurisdiction
 - How will regional low-level waste compacts be involved?
 - Can DOE disposal sites be considered?
 - What agency is ultimately responsible for decision-making and paying for disposal?
- Ultimate disposition capacity
 - Is there sufficient disposal capacity to manage a large radiological incident?
 - What is necessary to provide adequate temporary storage or staging?
- Communications
 - How can the public's concerns regarding storage, transportation, and disposal be addressed?

WORKSHOP RESULTS

The workshops were held on November 17-18, 2009 and were held in the following order: 1) private sector; 2) State and local; and 3) Federal. Each session opened with a statement from the OHS representative regarding the purpose of the workshop, followed by a presentation of the Liberty RadEx scenario, which was used as the basis for discussion. The scenario for this exercise was derived from DHS National Planning Scenario 11.[10] The exercise assumed an explosive device consisting of 3,000 pounds of ammonium nitrate mixed with diesel fuel, coupled with 2,300 curies of cesium-137. Using projections of the plume of deposition created for the exercise, EPA estimated waste generation of several million tons within the localized areas requiring evacuation or likely remediation (on the order of 100 million cubic feet). Depending on the long-term cleanup approach, total waste generation could be greater by an order of magnitude or more. This estimate includes only solid waste generated as a result of the incident and does not consider the management of contaminated water from decontamination, fire suppression, or rain events (although water used for dust suppression during demolition activities was estimated).

The workshop facilitator opened the discussion by assuring participants that no comments would be attributed to any particular source. He then walked through the interview process and went over the broad themes that would be covered during the discussion, which were derived from the interviews, as described above. He emphasized that EPA was not necessarily looking for consensus but would be asking participants to give their opinions on the highest priority actions for EPA to pursue, either alone or in conjunction with other entities. Participants were then shown a notional flow chart illustrating the different types of waste likely to be generated by an RDD incident (primarily low-level radioactive waste (LLRW), although the presence of contaminants regulated under the Resource Conservation and Recovery Act (RCRA) or Toxic Substance Control Act (TSCA) was also considered) and their potential management paths, as shown in Figure 1. Each of the discussion questions was then addressed in turn and specific suggestions recorded. At the conclusion of the discussion, each of the participants was asked to vote their three top priorities from the list of suggestions generated during the discussion.

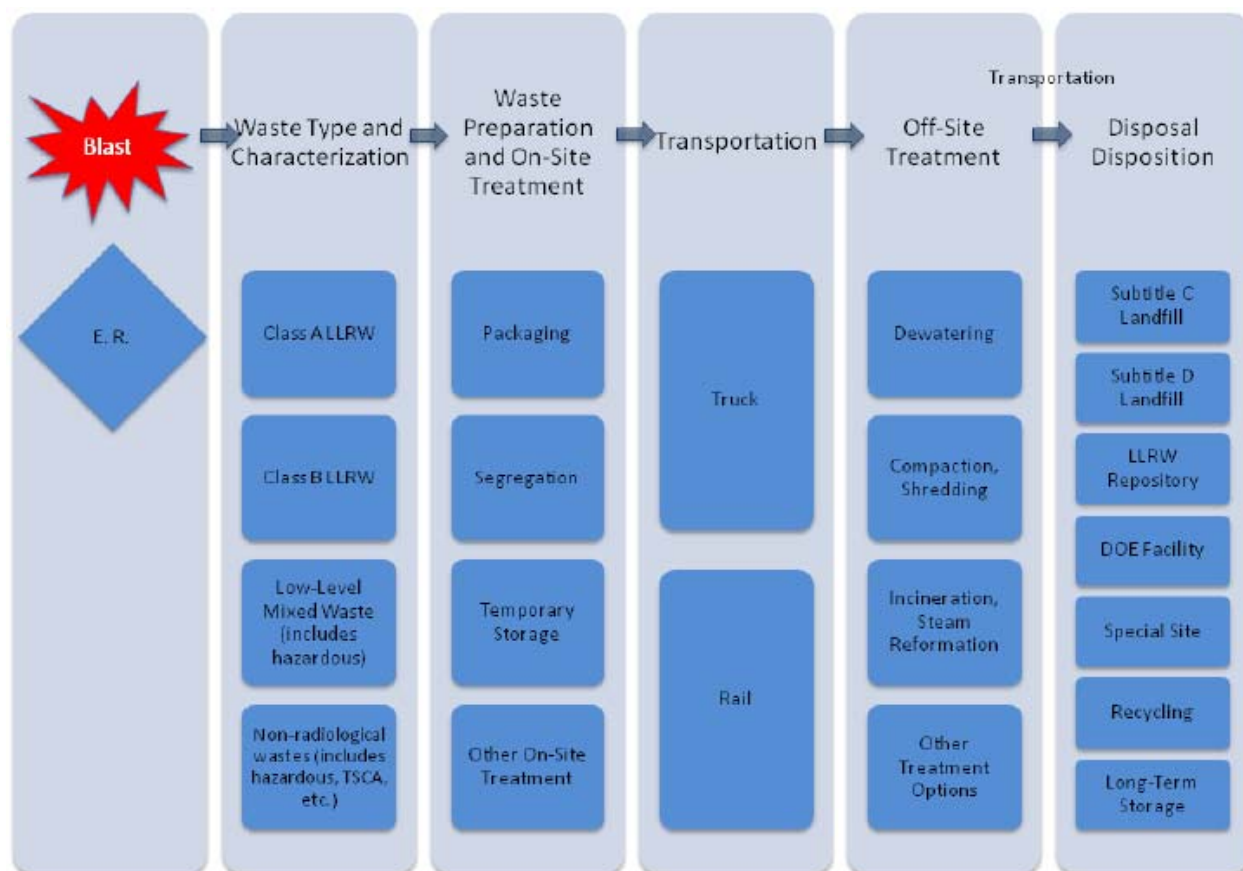


Fig. 1. Notional RDD Waste Disposal Process

As noted above, although EPA participants sat in on all three sessions, EPA personnel actively participated only in the session including other Federal stakeholders. During the other two sessions, they participated only to the extent of asking clarifying questions, encouraging elaboration on some points, or responding to questions.

Private Sector Workshop Results

Thirteen representatives from twelve organizations took part in the discussion from the private sector perspective. In general, there was the feeling that the types of waste generated from an RDD incident would not be qualitatively different from the types of waste handled routinely by the radioactive waste management industry. However, the scope of the incident and the anticipated pressures to move quickly to dispose of the waste would be likely to create significant logistical problems that would benefit from extensive pre-planning (e.g., availability of rail cars to achieve waste shipment goals). In particular, the participants raised a number of key issues, including:

- Will existing contracting mechanisms, statements of work, and interagency agreements (e.g., Memoranda of Understanding) be sufficient to manage large volumes of incident-related waste? Further, issues of liability and indemnification for private-sector service providers will take on greater importance in a politically-charged and time-sensitive

response, although standard contract clauses used today will probably adequately address this concern.

- How will decisions be made to manage “low-activity” waste, which is likely to make up a significant proportion of waste from a radiological incident? These decisions are likely to be made by State and local officials and could involve developing new facilities or utilizing existing options such as solid and hazardous waste landfills. The availability of sufficient laboratory capacity for waste characterization as a basis for decision-making is also highly uncertain.
- Communication with the public regarding waste management decisions, transportation, and worker safety issues will be extremely important. Although many of these issues will be local and there is no “one size fits all” approach, EPA may need to take a leading role in communication. Examples of successful communication with communities that have hosted radiological facilities could be helpful in this regard.

Perhaps not surprisingly, private-sector participants voted as their highest priorities actions that would assist them in preparing to be involved in a large response action. These actions included:

- Estimating the expected rates of removal and handling;
- Defining exemption or *de minimis* levels;
- Strategizing for local vs. out-of-state disposal, with consideration to “purpose built” facilities;
- Establishing criteria for characterization and disposal plans (e.g., data quality objectives);
- Preplanning analysis and characterization needs; and
- Developing a decision framework that can be used by the private sector to make business decisions.

State and Local Workshop Results

Ten representatives from six organizations participated in the session involving State and local entities with some responsibility for waste management. This group gave much more emphasis to communicating with the public and the importance of transparency in decision-making. Identifying disposal options was also cited as a high priority. Specific issues raised by this group included:

- How will responsible officials communicate effectively with the public and media on a range of issues (e.g., cleanup levels, decontamination methods, residual risk, and waste staging, transportation, and disposal)? Many of the more technical sources of information are not easily understood by the general public and relying upon highly technical explanations can create anxiety. The messages need to come from the right sources and be coordinated at the different levels of government (Federal, State, and local). If exemptions, waivers, or other modifications to standard practice are implemented for emergency reasons, these exceptions need to be clearly and carefully explained. Credibility, once lost, is nearly impossible to regain. The Centers for Disease Control has developed some material that would be useful in this regard.
- Shared sacrifice needs to be the theme for waste disposal from a radiological incident. All disposal options need to be considered. Regional low-level waste compacts will be

likely to look favorably on requests for access to their facilities from out-of-compact States in a national emergency situation, but compact officials would also expect that the State of origin will manage a substantial proportion of the waste itself. Some States may restrict access further or close facilities altogether if forced to accept large volumes of waste. States in regional compacts that have not developed disposal facilities may find it more difficult to access other compact facilities (Pennsylvania is the designated host state for the Appalachian Compact). Disposal capacity can probably be managed to a large extent because waste management activities will take place over a number of years.

- Waste management impacts on municipal facilities need to be explored further. For example, the impacts of remediation and decontamination activities on the cleanup of waste water treatment systems, management of sewage sludge (which may currently be land-applied), and use of solid waste transfer stations (which may already handle construction debris and be located within the contaminated area) all need to be considered. The ongoing generation of routine municipal solid waste, including generation of yard waste such as grass clippings, leaves, or tree branches, also has to be foreseen.

The priorities identified by the State and local participants differed somewhat from those identified by the private-sector participants. Priorities identified by private sector participants included:

- Developing plans for mass communication that address public inclusion and transparency;
- Engaging with regional compacts and State radiation officials regarding capacity and access to regional low-level waste disposal facilities or other disposal options;
- Defining criteria to support emergency changes to existing requirements, including free release criteria or licensing/permitting of disposal capacity; and
- Planning for decontamination and treatment, short-term waste staging, and use of public/private facilities for waste handling.

Federal Workshop Results

The Federal stakeholder session included eight participants from six agencies, as well as fourteen representatives from EPA headquarters and regional offices. This group overwhelmingly emphasized the importance of defining criteria for disposing of radiologically-contaminated material at different types of facilities. The group touched on a number of specific issues, including:

- How will EPA's overall ESF-10 responsibilities for long-term cleanup translate to waste management? "Ownership" of the waste could be a very important consideration in determining where the waste can or cannot go (to DOE disposal sites, for example). In other contexts, EPA will sign the manifest and be identified as the generator, but often in these cases EPA is the sole agency involved and acting under its authority pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). A coordinated multi-agency Federal response may be viewed differently, particularly if the response action falls under a different statutory authority, such as the Stafford Act.

- The need for an overall national recovery framework that includes a waste management strategy. Such a document could be envisioned to provide a detailed decision-making process that would allow Federal, State, and local officials to better plan the disposition of waste, including a hierarchy of treatment and disposal options, exemptions, waivers, and transportation. Both the NRC and DOE allow for alternative disposal on a case-by-case basis, and EPA has examined the generic disposal of radionuclides in hazardous waste landfills. The response to the 1987 incident in Goiânia, Brazil, involving the release of radioactive material from a sealed source, may also provide some insights.
- The importance of defining decision criteria for decontaminating or demolishing buildings. Such decision criteria will have a significant impact on generated waste volumes, but decisions must involve the affected public. Decisions may depend on the type of building involved (e.g., residential, business, school). Segregation of waste streams will also be important.

Suggested priorities receiving the most support from the Federal participants included:

- Defining criteria for using alternative disposal options, including exemptions and formation of a working group to develop a national waste management strategy;
- Defining conditions under which access to DOE disposal sites could be granted and development of MOUs to that effect; and
- Developing a long-term research/exercise program to develop guidance for RDD exercises (work by the DHS Science and Technology Directorate to address chemical and biological incidents at airports was cited).

CONCLUSIONS AND NEXT STEPS

Although each of the three stakeholder groups touched on similar issues, it is clear from the above discussion that these three groups emphasized different priorities. Recognizing that this series of workshops represents a limited sample of the professionals that would be involved in the response to and recovery from a radiological incident, these results strongly suggest that efforts to develop a national strategy to manage incident-related waste must involve all stakeholder segments in order to be effective. Planning, preparation, and decision-making must be open and transparent to the general public, if not directly including members of the public in these processes. It may, therefore, be necessary for agencies to make special efforts to ensure public representation at exercises and workshops. Agencies also need to consider how to balance public involvement with internal or interagency policy development processes most effectively. Public involvement of this nature may initially involve only a limited number of outside stakeholders. The general public has become increasingly sensitive to the equity and public health issues raised by waste management decisions. It will be particularly challenging to adequately represent the diversity and range of viewpoints expressed by members of the public regarding waste management decisions, and to understand how they may differ in situations such as routine generation, specific site cleanup, or disaster aftermath (e.g., the BP oil spill or Hurricane Katrina). Nevertheless, timely and effective management of waste from a radiological incident is likely to be affected by public confidence in these waste management decisions and the credibility of the decision-making process.

EPA continues to evaluate the priority actions identified in the workshops, as well as findings from Liberty RadEx, as EPA develops and begins to implement strategies to address waste management issues related to radiological incidents. The TAD workgroup held another series of workshops focusing on an anthrax scenario in Columbus, OH in September 2010. EPA is evaluating opportunities to hold additional workshops on threat agent disposal issues in other locations.

DISCLAIMER

The U.S. Environmental Protection Agency managed the effort described in this paper. It has been subjected to the Agency's review and has been approved for publication. Note that approval does not signify that its contents necessarily reflect the views of the Agency.

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