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1997 Lost Source Exercise

An Exercise of Radiological Response Through Cooperation and Coordination of Local, State and Federal Agency Resources Under the National Contingency Plan

Prepared by
U.S. Nuclear Regulatory Commission

U.S. Environmental Protection Agency

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1997 Lost Source Exercise

An Exercise of Radiological Response Through Cooperation and Coordination of Local, State and Federal Agency Resources Under the National Contingency Plan

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ABSTRACT

This report describes an exercise conducted by the Environmental Protection Agency (EPA) Region III and the Nuclear Regulatory Commission (NRC) Region I with the assistance of the Department of Energy (DOE), the Commonwealth of Pennsylvania and Chester County, PA. The exercise took place on September 30, 1997 and October 22, 1997. It demonstrated an emergency response and source recovery operation involving the private sector, county government and state government, utilizing federal assistance from multiple federal agencies. The federal assistance was provided under the National contingency Plan (NCP) using the notification and communications procedures as described in the Federal Radiological Emergency Response Plan (FRERP). The FRERP identifies the EPA as the Lead Federal Agency (LFA) under certain circumstances. These circumstances include events where radioactive materials licensed by the NRC are involved but the identity of the licensee is unknown. This designation from the FRERP was used as a model in this simulated NCP response. This report shows how such a response would be conducted, and may be useful for training in emergency response and as a blueprint for future exercises of similar nature.

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ACKNOWLEDGMENTS

The Lost Source Exercise was conceived and organized by Bill Belanger of the U. S. Environmental protection Agency (EPA), Region III and David Chawaga of the U. S. Nuclear Regulatory Commission (NRC), Region I. Special thanks go to Eric Weinstein of NRC's Office for Analysis and Evaluation Operational Data (AEOD), who facilitated the exercise and who contributed the basic organization of the tabletop exercise. Special thanks also go to Bill Steuteville of EPA Region III, who also facilitated the exercise and contributed the basic understanding of the authorities and procedures for the National Contingency Plan as it applies to radioactive materials. In addition, the authors would like to thank PECO Energy Company for generously providing the facilities where the exercise was held, as well as the U. S. Department of Energy (DOE) Brookhaven National Laboratory Radiation Assistance Program (RAP) Team for their technical assistance. Finally the authors would like to thank Browning Ferris Industries, Inc. (BFI) for adding to the realism of the source recovery. Other members of the Exercise Planning Committee included Doug Broaddus, US NRC Office of Nuclear Materials Safety Safeguards; Steve Centore, DOE Brookhaven Laboratory; Frank Costello, NRC Region I; Randy Easton, PA DEP; Tom Hugh es, PEMA; John McGrath, NRC Region I; Michael Shuler, PECO Nuclear; and James Yusko, PA Department of Environmental Protection Southwest Region. The exercise would not have been possible without their participation.

INTRODUCTION

During the mid to late 1990s, radiation detection systems have been installed in increasing numbers at waste disposal and processing facilities, as well as scrap metal facilities. During this time the States, the U.S. Nuclear Regulatory Commission and the U.S. Environmental protection Agency have noticed a significant increase in the number radiation alarms reported by these facilities. This increase most likely reflects an increase in the number of radiation detectors present at waste disposal and scrap metal facilities rather than an increase in the amount of uncontrolled radioactive material. Nonetheless, there is a significant potential for radioactive sources to find their way into commerce, which NRC is working to reduce. Examples of these "lost sources" include the following.

In August of 1996, workers removed a radioactive gauge containing americium-241 from an industrial process in Racine, Wisconsin. The Radiation Safety Officer did not discover the unauthorized removal of the gauge until November of that year. The source was never recovered, and the licensee believes it was sent to a landfill.

In September,1997 a radiography camera was reported missing. The camera was located in a pickup truck and the truck was stolen. The incident happened near Tulsa, Oklahoma. The camera was subsequently recovered and was intact, but there had been the potential for it to enter the waste stream or the scrap metal market. Loss of a source of this type is the basis for the data used in the Lost Source Exercise.

In September of 1997, an americium-241 gauge was removed from an assembly line in Allentown, Pennsylvania. In this incident, the gauge found its way to an automotive scrap metal facility. Unlike the 1996 incident, the gauge went through the metal shredder and the container was breached. This resulted in approximately 40 cubic yards of contaminated waste, as well as the ruptured source, which the Department of Energy removed for disposal. This incident was noteworthy because, in responding to the State request for assistance, Federal Agencies followed the procedures described in this exercise.

In all, during 1996 (the latest year available at the time of this writing), NRC's Office for Analysis of Operational Data reported 88 incidents where there was a loss of control of NRC licensed material, and 76 similar incidents of agreement-state licensed material. In the April 1995 and March 1998 issues of *Health Physics*, Lubenau and Yusko describe the occurrence of radioactive materials in recycled metals.

While the regulatory agencies may be able to reduce the number of incidents where there is a loss of control over radioactive materials, there will always be a potential for radioactive materials to enter the waste and scrap metal operations. It is not practical to reduce human error to zero and there are also foreign sources where United States regulatory agencies have no authority. Certain radioactive substances can also enter the public domain legally, as when a radio-pharmaceutical leaves the hospital in the body of a patient. This presents a wide

spectrum of potential alarm situations, all of which must be addressed in some way.

Radiation alarms at waste facilities often are attributable to contamination from short-lived medical isotopes or involve small quantities of radioactive material lost, stolen, or otherwise released by the private sector. Similarly, alarms received from scrap metal facilities may result from inadvertent disposal of radioactive source materials along with scrap metal. The appropriate response to such incidents often involves isolating the material and holding it for a few days, weeks, or months until the material adequately decays. Other circumstances require provisions for long-term cleanup, storage, and/or disposal of radiological material. In either case, the facility may return the material to its owner (or last known point of origin) as long as the shipment conforms to Department of Transportation regulations. The facility may also ship the material to a radioactive waste disposal facility. Since these and other incidences involving radioactive materials may pose a threat to health and safety, government agencies, (including DOE, EPA, NRC and the States) must be prepared to quickly and appropriately respond through predictable and consistent means.

Responding to these alarms imposes a significant burden on State resources, and can, in turn, impose a burden on Federal Agencies responding to State requests for assistance. The States are requesting EPA and NRC and DOE assistance in these response activities, and so the Federal agencies are also being affected by the increased burden.

EPA and NRC and DOE share responsibility for radiological incidents in the private sector and public domain and are natural partners in radiological response. The Federal Radiological Emergency Response Plan (FRERP), dated May 8, 1996, designates a Lead Federal Agency (LFA) for all types of radiological responses to emergencies. For example, the EPA is the designated LFA for responses to emergencies in which sources are of unknown, unlicenced, or foreign origin. By contrast, the NRC is the designated LFA for responding to incidents involving materials licensed by the NRC or an Agreement State. The DOE maintains an independent Radiological Assistance Program which may respond to State requests for assistance independently or as part of the FRERP.

The EPA also has the ability to respond pursuant to the Comprehensive Environmental Response, Compensation and Liability Act, of 1980 (CERCLA), as amended, and the National Contingency Plan (NCP) adopted under CERCLA authority. CERCLA and the NCP give EPA broad funding and response authority to protect the health and welfare of the public and the environment.

The Lost Source Exercise, conducted in Coatesville, PA in September and October of 1997, was an opportunity for the EPA and the NRC to coordinate their response efforts with those of DOE and state and local officials to address a public domain incident using FRERP and NCP authorities. This exercise examined the ways that Federal assistance can be provided to state and local officials by the EPA, NRC, DOE pursuant to the FRERP and NCP during a public domain, private sector incident.

Participating Organizations (in alphabetical order)

1. Browning Ferris Industries, Inc. (BFI)

2. Chester County Emergency Management Agency
3. Federal Emergency Management Agency (FEMA)
4. PECO Energy Corporation (formerly Philadelphia Electric Company)
5. Pennsylvania Department of Environmental Protection (PA DEP)
6. Pennsylvania Emergency Management Agency (PEMA)
7. U.S. Department of Defense, Defense Nuclear Weapons School
8. U.S. Department of Energy, Brookhaven Radiological Assistance Program (BNL RAP)
9. U.S. Environmental Protection Agency (EPA)
10. U.S. Nuclear Regulatory Commission (NRC)

Purpose of the Report

This report documents The Lost Source Exercise conducted by EPA Region III and NRC Region I on September 30 and October 22, 1997. This exercise demonstrated an emergency response and source recovery operation conducted by state and county government, as well as the private sector, utilizing assistance from a variety of Federal agencies. The Federal assistance was provided under the NCP, using the FRERP notification and communications procedures and LFA designation as a model. This report shows how such a response would be conducted, and may be useful for training related to emergency response.

Most participants also urged that similar exercises be conducted on a regular basis in other locations throughout the country. This report provides the information needed to facilitate such exercises, including details concerning the exercise scenario, guidelines and ground rules (provided in the appendices to this report.)

This exercise provided also demonstrated the EPA Radiological Emergency Response Plan (RERP) for Region III as well as the necessary interfaces with the other Federal agencies. This demonstration includes the use of the NCP On-Scene Coordinator (OSC), a Superfund employee, in the role of the On-Scene Commander as defined in the FRERP. Until this exercise, these roles were not thought to be the same. When EPA is the LFA, the FRERP On-Scene Commander was envisioned as coming from the EPA Radiation Program, not the Superfund Program. EPA Region III now uses the NCP in addressing radiation incidents. Other EPA Regions may wish to consider this approach on the basis of the exercise results documented in this report.

The exercise also demonstrated what the NRC should expect from the EPA as the other EPA Regions adopt an approach similar to the Region III RERP. It also gave the NRC an opportunity to observe the Unified Command approach employed by the EPA's OSC, and it demonstrated what the NRC is expected to contribute to provide an appropriate level of support to the EPA and ultimately the State and local organizations in a response where EPA is the LFA.

Other participants, including the State Radiation and Emergency Management Officials in attendance and several Federal agencies, were unfamiliar with the role the NCP and the NCP OSC could play in responding to a radiological incident. This exercise provided an opportunity for the participants to understand the new capabilities that are available by utilizing the NCP as a radiological incident response

mechanism. It also demonstrated the Federal resources that are available for use in responding to a materials incident, and allowed the participants to see a simulated source recovery operation.

Organization of the Report

This report comprises seven main sections, including the Introduction, Overview of the Public Domain Response, Exercise Objectives, Summary of the Tabletop Exercise and Lessons Learned, Summary of the Field Exercise and Lessons Learned, Exercise Accomplishments, and Discussion and Recommendations. Appendices provide the detailed scenario and agenda used for the exercise, controller messages, guidelines and ground rules, a summary of the exercise critique by participants, lists of exercise planning committee members and participants, and a list of abbreviations used in this report. The appendices give sufficient information to repeat the exercise in other locations. Some information contained in the tabletop and field exercise summaries is repeated in the appendices for the convenience of the reader.

Overview of the Public Domain Response

The EPA and the NRC conceived and conducted the Lost Source exercise to demonstrate the capability to mount a regional multi-agency response to a radioactive material release in the public domain, since such releases in the public domain pose a different set of problems than those involving a fixed nuclear facility. In the public domain, there is no advance knowledge of where a release might occur, and the identity of the licensee or responsible party might not be known or the licensee might not have the ability to maintain financial responsibility. By contrast, releases at a fixed facility usually originate from a point somewhere within the facility, and the fixed facility has a known licensee or responsible party who can be held responsible for cleanup activities. Consequently, for releases in the public domain where the identity of the licensee is unknown or where the material is of foreign origin, the FRERP designates the EPA as the lead Federal agency.

The purpose of this exercise, the multi-agency response to an incident in the public domain involved EPA Region III, NRC Region I, the DOE Brookhaven RAP team, Pennsylvania DEP and PEMA (the cognizant State agencies in this case) local officials and commercial industry representatives. Representatives from FEMA and the DOD Defense Nuclear Weapons School observed the exercise and discussed the capabilities which could be provided by their agencies. The response was conducted at the regional level for two reasons. First, the EPA Region III RERP was unique when the exercise was conducted, because it included radiological incident response under the NCP. The nine other EPA regional offices had not yet incorporated similar provisions. Second, the size and nature of the release were chosen to require only a response on the regional level, a situation which is typical of most releases in the public domain. The regional response reflected the provisions of the FRERP, while also examining resources available through the NCP that may be appropriate with the EPA as the designated LFA. Also, the reader should note that, in playing the cognizant state government, Pennsylvania represented the necessary interface between the Federal government and any State involved in a given incident.

In addition to demonstrating multi-agency response capability, the Lost Source Exercise yielded a number of ancillary benefits. For example, this exercise gave participants the opportunity to review current incident response plans, which are geared to the FRERP, and to determine how those plans may need to be better integrated with the NCP. In particular, this exercise examined the process for determining LFA responsibilities and other agency support activities. This is important, since the recent revisions to the FRERP have not otherwise been exercised under conditions involving a spill of radiological material of unknown ownership licensed under the Atomic Energy Act (AEA), with the EPA designated as LFA. In that capacity, the EPA's primary intent is to coordinate Federal response and assistance activities from the scene.

The Lost Source exercise also provided an opportunity for the staff of EPA Region III, NRC Region I, DOE Brookhaven, and various state agencies (PEMA, DEP, etc.) to work together side by side. It involved the EPA Superfund personnel as well as the EPA Radiation personnel who will work with the NRC and PA State Radiation and Emergency Response staffs. This allowed participants to develop a personal knowledge of their staff counterparts in other agencies. The attendees from FEMA, DOD and the states of NJ, DE and MD, while primarily in an observer role, also received the benefit of this knowledge. Industry representatives also received a similar benefit. This knowledge should greatly facilitate the multi-agency response to any real incident in the future.

Exercise Objectives

In conceiving and conducting the Lost Source Exercise, the EPA and NRC sought to achieve the following objectives:

1. The affected commercial facility should notify the appropriate State and local officials consistent with local emergency response plans and in a timely manner.

2. Local officials should notify the State consistent with local emergency response plans and in a timely manner.

3. The State should notify appropriate Federal agencies consistent with State emergency response plans and in a timely manner.

4. Demonstrate interagency communication and coordination protocols for radioactive material response under the NCP.

5. The affected facility should evaluate and respond to an incident appropriately and in accordance with its own procedures. This requires an initial assessment of the severity of the incident and appropriate actions based on that assessment.

6. The local officials should evaluate and respond to an incident appropriately and in accordance with local emergency response procedures. This requires a further assessment of the severity of the incident and appropriate actions based on that assessment.

7. The State officials should evaluate and respond to an incident appropriately and in accordance with State emergency response procedures. This requires a further assessment of the severity of the incident and appropriate actions based on that assessment.

8. Demonstrate technical assessment capabilities of the local, State and Federal agencies.

9. Demonstrate effective assessment of the danger to public health and implementation of actions to protect the public by the local, State and Federal agencies.

10. Demonstrate unified command procedures and the ability of these procedures to facilitate safe and effective recovery practices by response personnel. Response personnel from multiple State and Federal agencies should perform as a unified team.

11. Evaluate availability and adequacy of support equipment (instruments, tools, etc.)

12. Exercise the EPA Region III Radiological Response Plan.

13. Evaluate consistency of NCP response with protocols established in the FRERP

14. Provide training to participants. In particular, the exercise should familiarize the participants with the NCP and response procedures under the NCP. Participants should also become personally acquainted with each other.

15. Produce training materials and a training video for possible national distribution, in conjunction with the Council of Radiation Control Program Directors (CRCPD).

16. Exercise Manual Chapter 1301.

Summary of the Tabletop Exercise and Lessons Learned

The tabletop portion of the Lost Source Exercise was conducted on September 30, 1997, as a scripted exercise facilitated by Eric Weinstein of the NRC's Office for Analysis and Evaluation of Operational Data (AEOD) and Bill Steuteville of EPA Region III's Superfund Program. According to the script, this scenario presented the participants with a situation that unfolded as the exercise continued. The exercise began when the local emergency response "911" line received a call from a hypothetical landfill. The initial responders from the local Emergency Management Agency found gamma radiation levels well above background at a distance of several blocks from the facility. Local officials then notified the cognizant State Emergency Response and Radiation personnel, who were presented then with additional data. This data consisted of two detailed maps of gamma radiation levels, one on a ten by ten-foot grid extending several hundred feet from the source and the other on a fifty by fifty-foot grid covering several thousand feet. The maps presented a number of technical problems, as well as administrative issues to be resolved by the participants.

Among the technical issues, participants faced the problems associated with a truck containing an exposed iridium source, with postulated gamma radiation levels high enough to pose an imminent threat to the public. As a result, participants could not simply move the truck off the site. They also faced the potential for driver exposure (both past and future) and were compelled to determine what to do with the truck in the short term. The charge given to participants was simply to stabilize the situation and get the truck to a safe location where it would

not pose an immediate danger to the public. On a map of the site provided to the participants, an unused area of the landfill was indicated. This area was away from public access and provided the potential location to move the truck without the need to travel the highways.

Despite the complexity of the technical problems, the administrative issues were the main focus of the tabletop exercise. The Exercise included a number of participating organizations, including the landfill operators, local and county response officials, State emergency management officials, State radiation officials and the various Federal agencies. Each of these participants had their own capabilities and responsibilities, as well as their own way of doing things. Consequently, a primary objective of the tabletop exercise was to combine these capabilities into a unified response. To achieve that objective, each of these participants gave a short presentation concerning their perception of their own organization's role and how they expected to interface with the others. As these presentations continued, the participants began to explore their interfaces with the others. Eventually the participants achieved a unified response to the incident by forming a Unified Incident Command (UIC), through which the participants jointly decided on the appropriate solution. In addition, the participants learned the following lessons by conducting the tabletop portion of the Lost Source Exercise:

- The EPA Superfund Program encompasses substantial capabilities and authorities, which can be mobilized in the event of a radiation emergency (whether or not the material is licensed under the AEA.)

- Each responding entity has its own goals and priorities during a response. These goals and priorities are dynamic and may evolve as the situation develops. For example, in this exercise, private industry wanted to minimize the impact on business operations, solid waste agencies wanted to ensure that the continuing stream of municipal waste had a place to go, county officials handled the immediate threat, State officials had the ultimate responsibility to protect public health from the radiation threat, and Federal officials provided technical support and had the capability to mobilize significant resources. While it was not apparent in this exercise, these dynamic priorities might be expected to conflict at times throughout a response.

- Federal notification procedures are well defined within each federal agency, but an individual agency's internal procedures are not well known among the other agencies. Consequently, the federal community needs to develop a standardized notification scheme that applies to the Federal response as a whole. While the FRERP provides a standardized notification scheme among the agencies, internal procedures are not consistent from agency to agency. This can result in confusion as the federal team is formed.

- The UIC concept was not familiar to all of the participants. This concept needs to be better explained in future exercises and training opportunities.

- Management personnel within the various Federal agencies need to recognize and utilize the benefits of the LFA concept and interagency

coordination under the FRERP and the NCP, and the agencies must then act within the defined protocols.

- Notification thresholds need to be better defined for each agency and office. The NCP specifies required notification of the National Response Center of releases of all chemicals (including radioactive materials) exceeding certain reportable quantities (RQs) specified in the NCP. The agencies responding to radiation incidents are generally unfamiliar with this legal requirement. A courtesy notification at lower levels should also be considered.

- Federal officials need to recognize that the States differ greatly in their capabilities and their needs. This includes responsibilities associated with Agreement State status, different responding organizations within each State, and the roles of local government in emergency response.

- The tabletop radioactive materials exercise provided a unique opportunity for incident responders from all levels of government to meet, get acquainted, and clarify the respective roles in emergency response. Similar exercises should be conducted in other parts of the country.

- Early notification of the appropriate DOE RAP team should be routine. The RAP team needs to know of a developing situation, rather than simply being called in after the fact.

- Private sector capabilities and constraints are highly variable and will need to be considered on a case-by-case basis. Industry groups should be consulted when government emergency response plans and procedures are formulated.

- Local government may play a significant role in emergency response and must not be overlooked in either the planning or the actual response activities.

- Agency acronyms and jargon should be carefully avoided when multiple agencies are acting in concert. There are many conflicting acronyms between agencies. For example, "NRC" may stand for the U.S. Nuclear Regulatory Commission or the EPA's National Response Center. Such conflicts and unfamiliar jargon restrict effective communication.

- A status board is needed for future exercises, and should be used in a real event.

Summary of the Field Exercise and Lessons Learned

The field portion of the Lost Source Exercise was conducted on October 22, 1997, as a logical continuation of the tabletop exercise. The initial condition in this scenario was that the truck had been moved to a safe location within the hypothetical landfill, where it had been isolated from the public and posed no immediate threat. The goal presented to the participants for the field exercise was to recover the source.

After an initial briefing on the situation, a UIC team was broken out to a separate room. Specifically, that team included representatives of all involved parties (the landfill operator, the local and county officials, the State emergency management and radiation officials, and the Federal officials.) With the EPA as the Designated LFA, the Superfund representative (whose

job title is also OSC) acted as the OSC. EPA, NRC, DOE, and State radiation officials acted as the scientific support team.

Working together, the team elected to recover the source using DOE procedures and equipment. The technical approach was for the team to enter from behind a dumpster filled with dirt to provide shielding. This approach accomplished the recovery with a dose of about 100 mrem to the most exposed member of the recovery team.

For the recovery simulation, the exercise coordinators constructed a realistic physical simulation of the situation. PECO Energy provided the facility where the exercise was conducted, and this simulation was constructed in the parking lot of that facility. BFI provided a large packer truck to add realism to the simulation. To simulate a load of municipal trash from the packer truck, the coordinators placed a large number of plastic trash bags, inflated with air, on a 30-foot tarp. Other simulated trash from the PECO Energy was placed with the trash bags. A dumpster was moved into position beside the simulated trash to provide simulated shielding. Finally, a dummy radiographic camera and source were placed in the trash pile. Radio-controlled survey meters added to the realism of the simulation. This physical simulation allowed the exercise to include a highly realistic simulation of the recovery of a source. The multi-agency entry team gained valuable experience working together and many of the other exercise participants had an opportunity to see how a real source would have been recovered.

The recovery was accomplished by an entry team consisting of DOE, NRC and EPA. State and local officials and industry representatives were included in the UIC to decide on the recovery strategy, but the entry team consisted of the experienced Federal field personnel. Recovery of the source was accomplished using the procedures agreed upon by the UIC in the morning session. To further add to the realism of the field exercise, the exercise organizers held two mock press conferences, one before the recovery to discuss actions in preparation, and one after the recovery focusing on what the team had done to eliminate the threat to the public. These provided a realistic challenge to the command team and also allowed an explanation of the recovery to be presented to the entire group.

As a result of the field portion of the lost Source Exercise, the participants learned the following lessons:

- The DOE and DOD possess a large body of expertise and resources, and the FRERP and NCP provide a means to access those resources. In addition, individual cooperative agreements between the various agencies can be used in addressing incidents. The Unified Incident Command gives a useful mechanism to employ these cooperative agreements.

- By providing a practical scenario to apply the the UIC concept, this exercise gave participants a valuable learning experience. Many participants suggested in their comments that this experience should be shared with others.

- Many participants also commented that the opportunity to witness recovery of a highly radioactive source very valuable, and that the experience should be provided to others.

Exercise Accomplishments

1. The affected commercial facility notified the appropriate State and local officials consistent with local emergency response plans. The exercise revealed some lack of clarity in the notification procedures used by the facility, and the plans will be clarified.

2. Local officials notified the State consistent with local emergency response plans. As result of the exercise, the State participants identified additional State radiological capabilities that were already in place but had not been fully integrated into a unified whole.

3. The State notified the appropriate Federal agencies consistent with State emergency response plans. The Federal agencies found that there is a need to unify the Federal notification under a single contact point rather than ask the State to notify several Federal agencies.

4. The Federal agencies demonstrated interagency communication and coordination protocols for radioactive material response under the NCP. Response under the NCP was new to many participants, and the exercise was a valuable learning experience. Subsequent to the exercise, the NCP OSC has been the Federal lead official at several actual responses with good results.

5. The affected facility evaluated and responded to the incident in accordance with its own procedures. The commercial facility operators realized, as a result of the exercise, that additional facility response capability was needed. A radiological consultant was subsequently retained by the facility. Since the facility represents one of the largest waste disposal firms in the United States, this accomplishment is likely to be far-reaching.

6. The local officials responded to incident in accordance with local emergency response procedures.

7. The State officials evaluated and responded to the incident appropriately and in accordance with State emergency response procedures. The State demonstrated a correct assessment of the severity of the incident, and took the appropriate actions based on that assessment.

8. The local, State and Federal agencies demonstrated a wide array of technical assessment capabilities. These capabilities were adequate to deal with the problem.

9. The participants demonstrated effective assessment of the danger to public health and implementation of actions to protect the public by the local, State and Federal agencies.

10. The participants demonstrated UIC and the ability of these procedures to facilitate safe and effective recovery practices by response personnel. The UIC concept was new to a significant number of participants, so the exercise facilitators provided a short course on the subject. After the training, response personnel from multiple State and Federal agencies performed successfully as a unified team.

11. Support equipment (instruments, tools, etc.) which were available through the

State and the Federal agencies, were found to be adequate.

12. The exercise demonstrated that the EPA Region III Radiological Response Plan was a workable framework within which radiological emergencies can be addressed.

13. The exercise demonstrated the consistency of NCP response procedures with protocols established in the FRERP

14. The exercise provided training to the participants. In particular, the exercise familiarized the participants with the NCP and response procedures under the NCP. Participants also became personally acquainted with each other.

15. During the exercise, contract support personnel operated video cameras. These have been supplied to the Council of Radiation Control Program Directors (CRCPD) for use in training materials and a training video for possible national distribution.

Discussion and Recommendations

The Lost Source Exercise represented an initial effort to demonstrate the cooperation of Federal, State, and local agencies in response to a radiological incident. This response was carried out under the NCP with the EPA as the designated LFA. Overall, the exercise demonstrated the viability of the NCP in dealing with radiological emergencies.

EPA Region III is adopting a Radiological Emergency Response Plan which reflects this response mechanism. In addition, NRC Region I and the DOE RAP team at Brookhaven National Lab are now familiar with this response mechanism. Moreover, a response was successfully conducted using this model in an actual incident in Temple, PA in September, 1997. Consequently, in the event that a real radiological emergency were to occur in the Mid-Atlantic States, one can reasonably expect that this response mechanism would be used.

The authors therefore recommend that similar exercises be conducted in other areas of the country. In addition, in view of the success of the response under the NCP, this response mechanism should be examined for potential application in other locations.

APPENDIX A
Exercise Scenario

The intent of the Lost Source Exercise was to involve the U. S. Nuclear Regulatory Commission (NRC), the Environmental Protection Agency (EPA) and the Department of Energy (DOE) as partners to assist the state in the response to a release of radioactive material. In this exercise, Pennsylvania played the role of the cognizant State. NRC participated in support of the EPA's response under the FRERP. EPA draws its authority from the National Contingency Plan (NCP), which authorizes EPA respond to radioactive material spills under certain conditions. EPA has authority so long as the licensee does not fall under the financial assurance provisions of the Price-Anderson Act or other Federal funding mandate (that is, the licensee is not a commercial nuclear power plant or DOE facility). Nonetheless, the EPA would not normally initiate a removal action using CERCLA (Superfund) funds unless other options to address the situation had been exhausted, or another Federal agency requested the assistance. The reader should note that the EPA response for the Lost Source Exercise was not conducted under the FRERP. However, the FRERP designates EPA as the Lead Federal Agency (LFA) in the event that radiological materials are involved and the identity of the licensee is unknown. Moreover, the regulatory structure provided in the NCP is not incompatible with the guidance in the FRERP; thus a response conducted under the NCP would also generally conform to the FRERP.

Under the NCP, DOE resources can be used for cleanup and disposal of released material, and the exercise committee anticipated that the EPA and NRC participants would realize this fact during the exercise. Thus, in order to accomplish the exercise objective coordination between EPA and NRC, the exercise also included DOE participation.

Incident response capabilities vary widely from State to State, with some having the resources for a significant cleanup endeavor, while others do not possess this level of resources. For the purposes of this exercise, the State was assumed not to have the necessary cleanup and disposal capability, which may or may not be the case for Pennsylvania. The intent was to simulate the capabilities of a typical State.

In order to satisfy the need for a regional response beyond typical State capabilities, the exercise committee felt that an incident would need to involve high radiation levels with a release (or a threat of release) of radioactive material to the environment. In the case of this exercise, high radiation levels were used as the factor that caused the State to request Federal assistance. It was also desirable that gamma radiation levels be significant enough to require the establishment of a "radiation area," thereby necessitating the use of Health Physics controls over the personnel who entered the area. This required cooperation between the EPA, NRC, and DOE, as well as State Health Physics personnel, thereby further exploring the interface between the Federal agencies and the State. (Current EPA Superfund guidance directs the establishment of a radiation area when

gamma levels exceed 5 mR per hour. In such a case, the radiation area perimeter is to be established at a location where the gamma levels are less than 2 mR per hour. The scenario was designed to create such radiation levels.)

This exercise took place in two parts. The first part involved a "tabletop" exercise oriented toward the initial communications, negotiations, and decision-making that would take place in activating the State and Federal agencies, as well as the planning that would need to take place before the radioactive material could be dealt with.

The second part involved a "field" exercise oriented toward the actual handling of the contaminated material and the health physics and radiation protection considerations associated with this activity, including a simulated manipulation of the unshielded source. As such, the field exercise represented a continuation of the scenario begun during the tabletop exercise.

Both portions of the Lost Source Exercise were conducted at the PECO Energy Emergency Operations Facility in Coatesville, PA. This facility allowed simulated manipulation of radioactive material in a controlled outdoor environment with little risk of undue public alarm from the nature of the activities. A "dummy" source was used to make the simulation realistic. PECO also agreed to allow the use of their radio-controlled survey meters to allow a realistic simulation of radiation levels near the source. Again, this made the simulation realistic, and facilitated the health physics aspects of the exercise. The DOE participated with a mobile command center from the Brookhaven National Laboratory (BNL) and a Helicopter from Andrews Air Force Base in Maryland.

Part 1 - Tabletop Exercise (September 30, 1997)

The organization and conduct of the Tabletop exercise follows. This section of the report is the agenda and schedule of events which were used for the first day's play. The exercise play followed the agenda very closely.

The exercise facilitators used the following information during the tabletop exercise. This information was reserved for facilitator use only, and is provided here to give the reader an understanding of the exercise planning process. The facilitators also supplied maps of gamma radiation levels to the participants on large (36 X 36-inch) sheets. These sheets are not included in this report because of their size. The data that was on the sheets is summarized in Table 2. The writers of this report modified this text slightly from the original handout to remove reference specific to this exercise so that others may use it more easily in future exercises. The actual material provided to the participants is in Appendix B.

Background Conditions

The exercise is predicated on the presence of radioactive material not under the control of an NRC licensee. The identity of the licensee is unknown because the radioactive source is concealed within a trash truck

The location of the trash truck route will be provided by the "truck driver" and during the debriefing of the truck driver. This will lead to the likelihood of Atomic Energy Act material with no known licensee, and will trigger the EPA involvement. This background is needed to allow EPA involvement early in the exercise before any specific label or identification markings are

available from the source, which will be buried deep in the truck.

Initiating Event

The initiating event is the triggering of a radiation alarm at a generic municipal waste landfill (WASTEHOME INC). The Actual name of the landfill will remain unidentified during and after the exercise to avoid the potential for public concern over routine landfill operations. The meter reading is off scale reading high. The landfill operator stops the truck and prevents it from entering the landfill. The truck is backed to the side of the scale station, but the alarm meter continues to be off scale. This prevents other trucks from entering the landfill because the operator is unable to clear the alarm condition. The Chester County 911 Center (the designated LEPC notification point) is contacted by the landfill operator.

Facilitator Note: Have WASTEHOME relay the contents of the call to the players.

This is the call that begins the exercise.

Time Line

9:00 - 10:00 Early Assessment by the Landfill Operator and Local Officials (About 8 min per question)

Facilitator Note: Relay Initial scenario information and then ask the following questions of the participants:

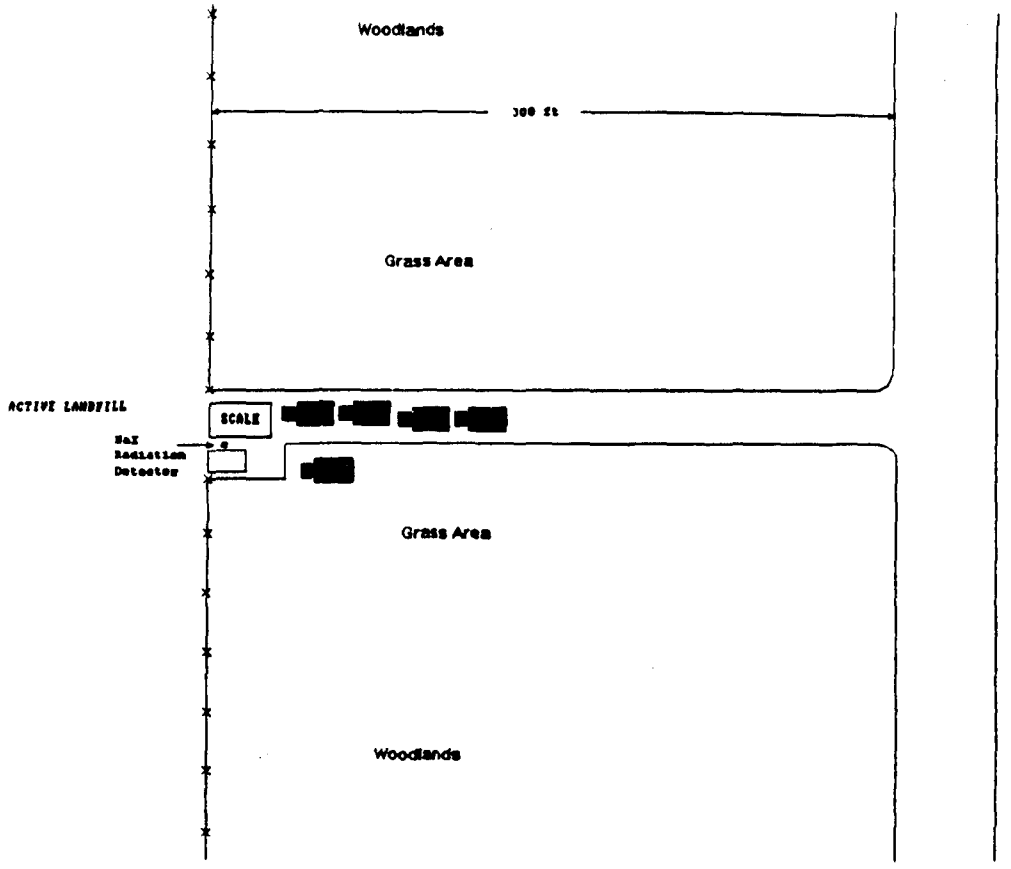
- What information is important for the first responders to get in order to respond adequately?
- What information would be provided to the first responders?
- Who are they?
- What would the landfill officials be doing while waiting for the response?
- What type of detection equipment would one expect to be available at a landfill?
- What would constitute an early Hazard assessment?
- What are the legal requirements on the part of the landfill to report the event?

10:00 - 10:45 Notifications (About 10 minutes per question)

- Who would the landfill owners first notify of the event?
- When would the State/ locals/ Federal organizations be notified?
- Who in those organizations would be notified and for what purpose?
- What organizations would those first notified organizations then notify?
- What is the purpose of early notification? Response? Resources? Assistance? Support?
- How and when is the media notified?

10:45 - 11:00 Break

11:00 - 12:00 Initial Response Actions (About 8 min per question)



State survey personnel discover that the source is not in the truck that was originally thought to be the problem. It is a truck that is third in line, about 100 feet away from the scales. Gamma levels at this distance are 11 mR/hr. This is why the alarm failed to clear when the first truck was diverted. Gamma survey results will be provided to the State personnel as follows.

- What would the first response actions be of the:
- Local Officials - Fire/Police/ Emergency Services?
- State Officials?
- Landfill owners?
- How would these initial response actions be coordinated?
- When is a JIC set up and whose responsibility is it?
- What are the truck drivers supposed to do while waiting for response actions?

Facilitator Note: Facilitator provides radiation data

(A large gamma map handed out at this time is not included in this report. Data are summarized in Appendix B.)

These values were obtained using the Microshield 4.21 computer program. An "equivalent source" was used to account separately for the buildup factors from the shielding of the truck contents and the truck

body. The source was placed 4 feet from the side of the truck, in the approximate center of the load. Density of the trash in the truck was 600 pounds per cubic yard at 20 percent moisture content. The truck side is one-eighth inch steel. Source strength is 100 curies. Data will be presented in the form of a site map rather than a table. The site map will be drawn as concentric circles around the original suspect truck, but the data will make it apparent that the source is at another location. Additional data for intermediate distances are available on a spreadsheet.

Gamma spec results will be an Ir-192 spectrum as processed through the same make and model instrument that the State would use. An actual or simulated printout from the instrument will be provided. From this data, the State should identify that Ir-192 is involved and that there is an unshielded source within the truck. The material is located in a truck about 100 feet from the scales. The radiation drops to 2 mR/hr at about 230 feet.

Facilitator Note: The State should contact EPA at this time.

12:00 - 1:00 Lunch

1:00 - 2:00 State and Federal Decision Making (About 8 min. Per)

- What information would be necessary for the State to request Federal Assistance?
- What type of assistance would be requested?
- What decisions would be made within the Federal government to provide that assistance?
- What authorities exist that allow the provision of assistance?
- What time would be required to plan for assistance to be delivered?
- Who would be in charge of the Federal response?
- What is the NCP and its relationship to the FRERP?
- What assistance would be provided under each plan and through what mechanism?
- The truck driver is interviewed to determine the area where his pick-ups were made and to assess his radiation dose. He is also asked about the loaders who picked the trash up from the curb. The two loaders are contacted at home and shown pictures of the gamma camera. One remembers picking it up (it was heavy) somewhat before the middle of the run, which lasted about 5 hours. This interview places the source toward the center of the truck. This will place it about 7 feet from the driver and the loaders.

Facilitator Note: Health physics calculation should be done for driver and loader exposures.

It is assumed there would be 5 feet of trash and one quarter inch of steel between the source and the driver with a two-foot air gap. Driver exposure will be about 900 mR/hr for more than 2 hours, resulting in an exposure with little likelihood of acute symptoms. The loader remembers lifting the device by the shield and noticing "something hanging out" which he did not touch.

Loader exposure should be similar to driver exposure.

Facilitator Note: Nevertheless, driver and loaders should be referred for medical evaluation.

2:15 - 3:15 Monitoring Plan and Data Analysis (15 min per)

- What plans are in plans to coordinate assessment activities with the State and local responders?
- What data is required for protective action assessment?
- What data is required to declare the emergency over?
- What assistance is provided by the Federal agencies following the emergency phase?
- How is the press kept informed and by whom?

3:15 - 3:30 Break

3:30 - 4:30 Recovery

- There are two residences within a mile of the current location of the truck, one at about 3000 feet and the other at 5000 feet. (A map will be provided to the participants.) These homes will be located far enough away from the source that evacuation may not be warranted but might be considered, radiation levels will be at background, but close enough to the event that a the question might come up.

Facilitator Note: Any monitoring of these homes should be planned during the exercise.

- What actions are required by the State, locals and landfill operator to enter "recovery" mode?
- What constitutes a recovery plan and who is responsible for developing it?
- What role does the Federal government have in recovery operations?
- What provision exists for assisting the State in cost recovery for clean up activities?
- What responsibilities are assigned to whom for recovery operations?
- What are the provisions to keep the public informed of recovery operations?

4:30 - 5:00 Exercise Summary

Facilitator Note: The general procedure for Part 2 should be defined. This should include the designation of a scientific support coordinator and appropriate support team to plan the details of unloading the truck and recovering the source. This committee will identify any resources needed for the unloading, but will not do the detailed health physics calculations or develop specific minimum-dose procedures at this point. This will take place in Part 2.

- Exercise coordinators provide an introduction to the 10/22 Field Exercise

5:00 Adjourn

This will end the tabletop with the situation temporarily stabilized until the truck can be emptied. If any of the above actions are not

accomplished, they will be initiated by the controllers because they are essential to Part 2 of the exercise.

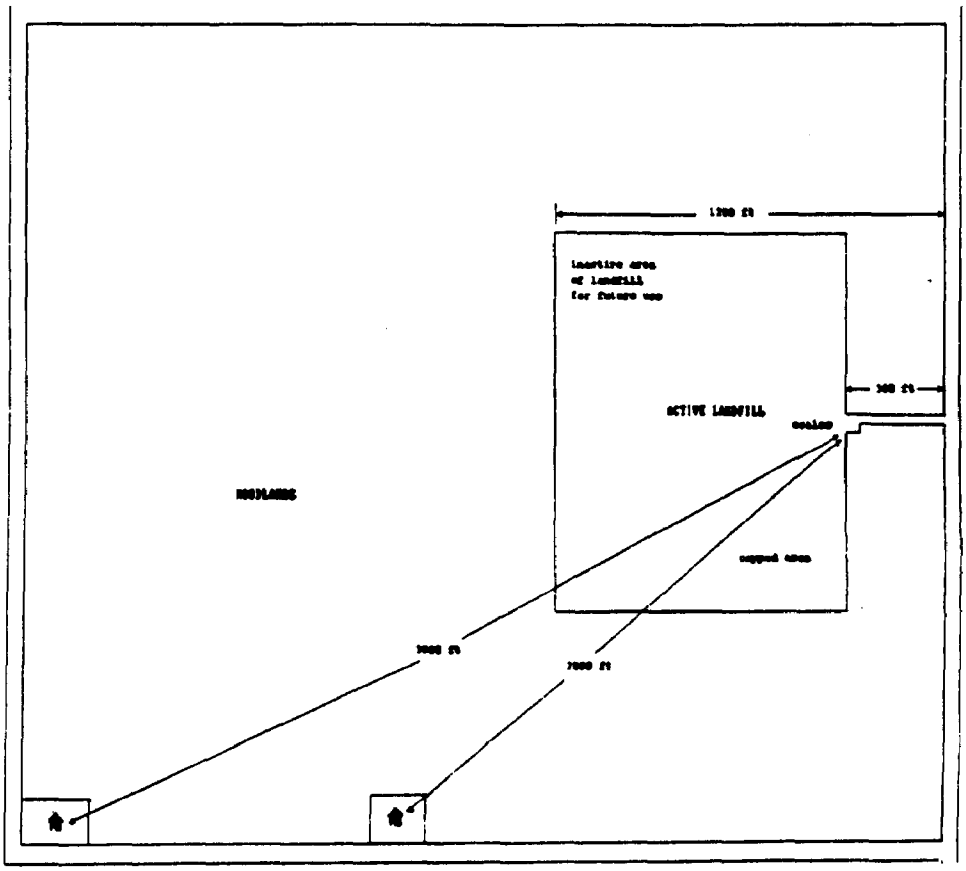
Part 2 - Field Exercise (October 22, 1977)

Initial Conditions

The initial condition for the field exercise (Part 2 of the Lost Source Exercise) is the same as the conclusion of the tabletop exercise (Part 1 of the Lost Source Exercise). Specifically, the truck containing the unshielded source is parked in an unused area within the landfill fence line, and a radiation area has been established. In Part 1, the participants identified the desirability of parking the truck in a low spot so the surrounding earth would provide shielding. There is considerable press and public interest in this situation. The neighbors are in an uproar and are demanding immediate removal of the radioactive material. People living several miles away have threatened legal action, and local politicians are demanding immediate action with suggestions ranging from driving the truck elsewhere to evacuating the area. Resources identified as needed in Part 1 are assumed to be available, and a disposal facility has been identified.

Health Physics

The initial activity for Part 2 was a planning session for emptying the truck and recovering the source. This included calculations of radiation exposure related to dumping the load and searching for the source, and development of minimum dose procedures and an outline for any training that may be needed for the people who will physically recover the source. The



participants independently established goals of the planning session, which included all goals necessary to complete the objectives of the exercise. The participants also formed an entry team and a Unified Incident Command (UIC) and conducted a source recovery planning session in a breakout room.

The planning session was scheduled for most of the morning and ended about a half hour before lunch. Simultaneous with the planning session, the participants not in the entry team or the UIC were given presentations on the capabilities of the participating agencies. At the end of the planning session, a mock press conference was held. This served two purposes, by allowing the planning team to present their strategy to the participants who were not in the breakout room, and presenting a realistic challenge to the planning team by the "press" and the "neighbors."

The (UIC) accomplished the following tasks:

- Establish the functions of the various agencies represented in the recovery effort. The UIC assigned the EPA Superfund team the task of concentrating on the physical and logistical aspects of source recovery. The EPA and NRC Health Physicists would then establish a health physics team, with the NRC heavily involved because of their experience with high gamma levels and radiography cameras. Press and political communications were also addressed, using the FRERP as a model.

- Identify the team who would recover the source. This team consisted of DOE and NRC personnel.

- Develop source recovery procedures.

- Establish radiation monitoring plans to assess the exposure of source recovery personnel.

- Decide on the appropriate protective clothing and personal protective equipment for recovery personnel.

- Establish "hot line" procedures for monitoring and decontamination.

- Perform dose calculations for source recovery personnel including the driver who unloads the truck and the technicians who handle the source.

- Identify the physical resources needed for source recovery. An example might be a lead shielded container, remote manipulators, etc.

- Identify a way to localize the source within the truck to narrow the search after the truck's load is spread on a tarp.

- Brief public affairs specialists on the procedures to be used, risks to the public, etc.

Source Recovery

This part of the exercise began after the lunch break. The physical recovery procedures depended on the procedure developed in the breakout session. However, for the purposes of this scenario, the committee was able to assume with reasonable confidence that the UIC would develop plans to dump the truck onto a tarp. This allowed the exercise committee to prepare the recovery area during the morning while the UIC was meeting to decide what to do. Experts on the team also suggested that in a real incident of this type, a dumpster would be filled with

dirt and used as a shield. After lunch, the recovery team was presented with a tarp covered with simulated trash. The "trash" consisted of green household waste bags inflated with air and weighted down with water balloons. A dumpster was placed next to the simulated trash, but the dirt fill was simulated for logistical reasons. A hot line defined with banner-guard and a step-off pad, were in place.

There was one exception from good field practice. The dumpster was placed to the side of the "trash pile" rather than in a line from the hot line to the trash. This was done to allow the participants to see the recovery of the source. In practice, the dumpster would be placed to shield the entry path of the recovery personnel. Team members wore appropriate protective clothing as decided in the morning session. "Level d" protection was selected on the basis of the assumption that the source was not powdered and so would not be airborne. (Ir-192 sources are in the form of small discs, not powder.)

The survey meters were manipulated to produce approximately square-law response during the recovery effort (the radiation intensity drops as the square of the distance.) The facilitator varied the gamma levels on the radio-controlled meter according to the following table:

Table 1

Distance (feet)	Gamma level
500 ft	1.6 mR/hr
250 ft	7.9 mR/hr
150 ft	23 mR/hr
100 ft	51 mR/hr
50 ft	200 mR/hr
30 ft	560 mR/hr
20 ft	1.3 R/hr
15 ft	2.2 R/hr
10 ft	5 R/hr
5 ft	20 R/hr
2 ft	125 R/hr
1 ft	500 R/hr

These radiation exposure values are predicated on a 100 Curie Ir-192 source with only air between the source and the survey meter. (This is because the truck has been dumped on a tarp.) Gamma levels are approximately 4 times their value when the truck and its contents provided shielding. The Microshield 4.21 program was used for these calculations.

The "trash" included a dummy radiography source and camera buried close to its center. PECO-supplied radio-controlled meters guided the recovery team to the source. The team then transferred the source to a shielded container and removed it from the trash. This transfer involved the use of a remote survey meter (Teletector) to locate the source, remote manipulators to move the trash and the source, and a small television camera to view the "hot" area from above to pinpoint the source location and see its condition. This equipment was provided by the DOE.

The dummy source was successfully transferred into a lead container. This ended the exercise. Calculated radiation exposures for the recovery team were approximately 100 mrem to each team member.

APPENDIX B
Controller Messages - Day One

The following messages were distributed individually to the participants during the tabletop exercise. Each numbered message was provided to the participants on a separate sheet of paper so they could not anticipate the coming events. The facilitators provided this information in accord with the schedule given in the exercise scenario in the main body of this report. Abbreviations were used only where they would be meaningful to the participants. There were no detailed controller messages for Day two. Initial conditions were specified and the exercise was played free-form with the participants choosing their own strategy.

1. The initiating event is the triggering of a radiation alarm at a fictitious municipal waste landfill, WASTEHOME INC. While a fictitious landfill is used for exercise purposes, a commercial landfill operator (BFI) has agreed to play the part of the landfill owner. While it is not possible to offer assurance to the public that the events described in this scenario cannot happen, it is the intent of the exercise planners to demonstrate responsible actions on the part of the landfill operators to minimize risk to the public.

   The landfill is located in a remote wooded area. There are two residences within one mile, one about 2000 feet from the scale and the other at about 3000 feet. The entry drive to the landfill is 300 feet long and terminates in a public road. The landfill itself is fenced for its entire perimeter and surrounded by woods on all sides outside the fence.

   The meter reading on the alarm is off scale reading high. The landfill operator stops the truck and prevents it from entering the landfill. The truck which was on the scale at the time of the alarm is backed to the side of the entry drive away from the radiation sensor, but the alarm meter continues to be off scale. This prevents other trucks from entering the landfill because the operator is unable to clear the alarm condition. The landfill operator has a low range G-M type survey meter, and it is found to operate erratically when turned on in the vicinity of the scale.

2. County HAZMAT team arrives at the scene. Gamma radiation levels are found to be 17 uR/hr above background several blocks from the driveway. (About 1200 feet) As the driveway is approached, gamma readings increase above 2 mR/hr and then drop to about I mR/hr at the entrance. Gamma levels increase to 6 mR/hr as the line of waiting trucks is approached along the driveway.

3. State survey personnel discover that the source is not in the truck that was originally thought to be the problem. It is a truck that is third in line, about 100 feet away from the scales. Gamma levels at the scales are 12 mR/hr. This is why the alarm failed to clear when the first truck was diverted. Gamma survey results will be provided to the State personnel on gridded survey maps. The

State gamma spectrometer indicates that the radionuclide is Iridium 192. Table 2 is included in this report in lieu of the maps provided to the participants. Data were presented in the form of a site map rather than a table. The map was 36 by 36 inches in size and included gamma measurements on a 10- by 10-foot grid out to 300 feet. Realistic "shadows" caused by the shielding by uncontaminated trucks were included on the maps.

Table 2

Distance from truck in feet (approximate)	Gamma survey meter reading
1200 ft	17 uR/hr
1000 ft	39 uR/hr
900 ft	58 uR/hr
800 ft	88 uR/hr
700 ft	140 uR/hr
600 ft	220 uR/hr
500 ft	350 uR/hr
400 ft	610 uR/hr
300 ft	1.2 mR/hr
250 ft	1.7 mR/hr
200 ft	2.8 mR/hr
150 ft	5.0 mR/hr
100 ft	11 mR/hr
50 ft	44 mR/hr
30 ft	91 mR/hr
20 ft	190 mR/hr
10 ft	560 mR/hr

A second set of maps of similar size contained data out to 1200 feet on a 50- by 50-foot grid. Additional data for intermediate distances was available on a spreadsheet. An Ir-192 spectrum was provided to the participants. From this data, the State identified that Ir-192 was involved and that there is an unshielded source within the truck.

4. Source strength is calculated to be about 100 curies, assuming an unshielded point source in the center of the truck. Approximately equal gamma levels on both sides of the truck suggest a location near the center. Density of the trash in the truck is 600 pounds per cubic yard at 20 percent moisture content, based on information on "typical" municipal waste obtained from the solid waste officials. The truck side is one-eighth inch steel. Gamma readings surrounding the truck are provided on a grid map.

5. The truck driver and loaders are interviewed to determine the route where pick-ups were made and to assess their radiation dose. The two loaders are shown pictures of the gamma camera. One remembers picking it up. It was heavy and had the remnants of a yellowish label, but most of the label was gone. The device was picked up somewhat before the middle of the run, which lasted about 5 hours. This interview places the source toward the center of the truck. This will place it about 7 feet from the driver and the loaders.

6. It is assumed there would be 5 feet of trash and one quarter inch of steel between the source and the driver with a two-foot air gap. Measured exposure in the driver's seat and at the loader stations is about 900 mrem per hr. This exposure is estimated to have lasted less than 3 hours, resulting in an exposure with little likelihood of acute symptoms. The

loader remembers lifting the device by the shield and noticing "something hanging out" which he did not touch. Loader exposure should be similar to driver exposure. There may be additional exposure accrued based on the location and stay time at that location (if any) before the area is cleared of personnel. This depends on the exercise play by the participants.

7. There are two residences within a mile of the current location of the truck, one at about 2000 feet and the other at 3000 feet. (A map will be provided to the participants.) Radiation levels at these locations will be at background. These homes will be located far enough away from the source that evacuation may not be warranted but might be requested by the residents. Radiation levels will be at background, but the homes are close enough to the event that the question might come up.

APPENDIX C
Exercise Guidelines and Ground Rules used for this Exercise

This appendix presents the guidance and ground rules for conducting the 1997 Lost Source Exercise. As such it provides the framework for conducting (or replicating) the exercise, demonstrating emergency response capabilities, and evaluating response activities. The appendix includes a discussion of the overall exercise conduct including exercise controller and facilitator responsibilities and functions, avoiding violations of laws, avoiding personnel and property endangerment, actions to minimize public inconvenience, exercise simulation guidelines, participant guidelines and gamesmanship, and conditions for exercise termination.

Exercise Controller and Facilitator Responsibilities and Functions

NRC Region I and EPA Region III have appointed exercise coordinators to oversee all exercise activities. These exercise coordinators are responsible for approving the objectives and developing the scenario time sequence. The exercise coordinators are also responsible for the selecting and training the personnel required to conduct and evaluate the exercise. The Defense Nuclear Agency has agreed to supply exercise evaluators. EPA Region III and NRC Headquarters will provide exercise facilitators.

The participating agencies will supply controllers for major functions where an emergency response action will be demonstrated. Before the exercise, the exercise coordinators will provide the controllers with the appropriate materials necessary for their assigned function. The materials will include any maps and messages to be used, as well as forms for documenting and evaluating observed activities. The main job of the controllers is to document the actions of their agency (for inclusion in the final report) and to ensure that the participant's actions reflect the policies and procedures of their respective agencies.

In each facility where an activity takes place, the designated facilitators will make judgments to keep the action going in accordance with the scenario time line. The exercise coordinators will provide advice to the controllers assigned to their facility to resolve minor exercise control issues or concerns that may occur. If a major exercise control problem arises, the controller should contact the exercise coordinator for guidance or resolution of the problem. Any requests for scenario modifications or holding periods must be cleared through one of the exercise coordinators. Controllers also have the authority to resolve scenario-related problems which may occur during the exercise.

Controllers will observe the participants as they perform their assigned emergency response functions. Controllers are responsible for being knowledgeable in the area of their assigned function and possible activities which may be observed. In the event of corrective or repair activities, the controller shall be cognizant of procedures associated with the action. If an activity is

to be simulated (as identified within the specific mini-scenarios or exercise ground rules), the controller shall request the participants to describe the actions that would be initiated to effect the desired outcome of the assigned task within the scenario time sequence of events and constraints allowed. The controllers will provide a verbal critique the effectiveness of the emergency response actions taken, and will also provide a written evaluation of their observations.

As information is provided to the participants, they should determine the nature of the emergency and implement appropriate procedures including emergency plan implementing procedures and emergency operating procedures. The hypothesized emergency will continue to develop on the basis of information provided to the participants. Wherever possible, operators should complete actions as if they were actually responding to real events. Inconsistencies in the scenario may be intentional and may be intentionally placed there to test the capabilities of the emergency response facilities to the maximum extent possible in a limited period of time.

Avoiding Violations of Laws

Violation of laws is not justifiable during the exercise. To implement this guideline the following actions must be taken:

(1) Participants must be specifically informed of the need to avoid violating any federal, state and local laws, regulations, ordinances, statutes and other legal restrictions. The orders of all police, sheriffs or other authorities shall be followed as appropriate.

(2) Participants will not direct illegal actions to be taken by other participants or members of the general public.

(3) Participants will not intentionally take illegal actions when responding to scenario events. Specifically, local traffic laws (i.e., speed limits) will be observed.

Avoiding Personnel and Property Endangerment

All participants will be instructed to avoid endangering property (public or private), other personnel responding to the events, members of the general public, animals, and the environment. All EPA personnel involved in the exercise will be field qualified and shall have completed the EPA's basic field safety course. NRC and State personnel will conform to their own field safety requirements. There will be no exposure to radioactive or chemical hazards during this exercise. No radioactive material above natural background will be used in this exercise. There will be no confined space entries. There will be no physical hazards except those associated with the wearing of protective clothing and with the weather. Loan of radio-controlled survey meters has been arranged from PECO Energy. These meters will provide realistic radiation readings to the response personnel without the need for exposure to radiation. "Dummy" sources will be used to represent the radioactive source to be simulated. These dummy sources will be provided by the NRC.

Actions to Minimize Public Inconvenience

It is not the intent, nor is it desirable, to effectively train or test the response of the public during the conduct of the exercise. Public inconvenience is to be avoided. The

simulated event, release of a significant quantity of radioactive material, could cause great public concern and would be quickly distributed by the news media. For this reason, all communications associated with this exercise shall be prefaced and followed by the words, "This is a drill" or "This is an exercise." This especially applies to radio or cellular phone traffic, which may be intercepted by outsiders. It also applies to telephone logs and written correspondence which may find its way into the trash stream. Local officials shall be notified of the nature of the exercise and invited to participate. It is important that conversations that can be monitored by the public (radio, loud-speakers, etc.) be prefaced and concluded with the words, "THIS IS A DRILL; THIS IS A DRILL."

Exercise Simulation Guidelines

Since the exercise is intended to demonstrate actual capabilities as realistically as possible, participants will be instructed to act as they would in an actual emergency. Wherever possible, emergency response actions will be carried out. Some of the exercise objectives will be demonstrated by simulating the associated emergency response actions. When an emergency response is to be simulated, the Controller will provide verbal or written directions on actions that are to be simulated. All decontamination actions associated with the scenario events may be simulated after discussion and approval by the Exercise Controllers. The use of respiratory protection and other personal protective equipment may be simulated by exercise participants after discussion and approval by the Exercise Controller. All radiation measurements will be made using PECO-supplied radio-controlled survey meters. No actual radioactive materials will be used during the exercise.

Guidelines and Gamesmanship for Participants

Exercise controllers will provide participants with command and message cards to initiate emergency response actions and evaluate participant actions. There are no formal evaluators assigned to the exercise. All participants and controllers are asked to function as exercise evaluators, noting things which went well and things which might be done better. Everyone will be asked to provide a personal critique at the end of the exercise.

Participants should play out all actions, as much as possible, in accordance with their agency's plans and procedures as if it were an actual emergency. If an action or data is to be simulated, an exercise controller will provide appropriate direction.

Day 1 play will be in a round table format so that each participant will be able to hear and see all the decisions and actions of all participants. Each action will be explained by the participant to the entire group using a microphone. This will assure that everyone can hear, and will allow the proceedings to be video-taped with good sound reproduction.

Exercise controllers have the authority to redirect play as necessary. If an Exercise Controller intervenes in a response action and recommends redirection or reconsideration of play actions, it is for a good reason. The exercise controller's direction may be essential to ensure demonstration of objectives for all participating groups.

Participants should use status boards and log books as much as possible to document and record their actions, and keep a list of items

they believe will improve their agency's plans and procedures. A participant debriefing will follow the exercise. Players should provide any comments or observations to a spokesperson for their group after the exercise. Areas for improvement or weaknesses when corrected will improve the overall emergency response capability.

Exercise Termination

The exercise will be terminated by the Exercise Coordinator when all emergency response actions have been completed in accordance with the exercise scenario time sequence and exercise objectives.

In the event that an actual plant emergency condition should occur, the exercise will be terminated to allow emergency responders to assume their normal duties. If the emergency affects only a small number of people within the exercise, the exercise coordinators may elect to continue the exercise with modifications to account for the missing personnel. In no case will the exercise be allowed to interfere with real emergency response duties of the participants.

APPENDIX D
Exercise Critique

At the end of each exercise day, exercise coordinators conducted critique sessions to summarize the major findings identified during the exercise. Each organization was asked to appoint a representative to provide the perspective of that organization. Written critique forms were also distributed to each participant.

Individual Statements on Lessons Learned (by those who elected to write extended comments):

Charlie Kleeman, EPA:

By far, the most significant lesson learned was that there are many individuals, private entities, and governing organizations that must be involved in an incident of the type that was exercised; and many of these are very unfamiliar with each other and each other's roles and responsibilities. Of particular note, I observed the following areas of concern:

Initial Local Notification - Wastehome, Inc. did not appear to fully understand the differences between "the LEPC" and the Chester County Emergency Management Agency (EMA). While in some communities, the EMA might well be directly identified as the LEPC, in this case I do not believe they are so identified. This therefore raises some concern over the initial notification. Early initial notification to the correct agency is essential to a good response, and so it is important for us to highlight to the response community that any confusion over whom to notify must be overcome.

Federal Notification - In the exercise, the PA DEP Bureau of Radiation Protection (BRP) made the notification to the National Response Center. Three points deserve mention here. (1) It was good that Federal notification was made by the BRP, and it would be good to highlight the importance of making early Federal notification whenever it is suspected that an incident is more than just a "nuisance" incident. This notification could have been made by the County EMA earlier, however it is understood that judgement calls must be made at every stage of an incident, and their decision not to make Federal notification at that time is not criticized. (2) There was a sentiment expressed and implied by State and local stakeholders, of some fear of opening the Federal floodgates, and thereby losing control of the incident to the EPA.

These stakeholders should be assured that EPA is not bent on "federalizing" local or State responses, and only wishes to provide assistance or authority as needed by the incident commander. (3) The exercise highlighted a potential problem concerning expectations once Federal notification was made. When Federal notification is made by a State or local government, it is imperative that it be communicated to the duty officer whether the notification is just notification or whether and what type of assistance is being requested.

Who's In Charge? - A little surprisingly, most participants said that the Fire Chief

was in charge. However, once the State, NRC, and EPA were on-scene , it was not as clear to all participants that the Fire Chief was still the incident commander. Discussion about this subject and about Unified Command in particular demonstrated significant weakness in the understanding and support by all participants in the Unified Command model. However, it is noteworthy that some participants did understand and support it.

The Response - It seemed to this observer that there was a bit too much discussion about who was in charge, about who could bring what expertise, about fears of Federal intervention, about uncertainty about what to do, and about what the source was or where it came from while there was not enough immediate attention given to move and shield the truck as a means of controlling and stabilizing the threat to human health. This is where the Federal EPA could probably have had a more prominent role if a clear request for help had been given at the earliest point.

John Feeney, NJ DEP:

At the end of the exercise, during the discussion period, I brought up the situation of the less significant or "nuisance" incidents, where the radioactive material is not a direct immediate health threat, but needs to be removed and disposed of properly.

The enclosed short report "Radiation Incidents Involving Contaminated Waste" (not included with participant packages) summarizes the incidents we've had to deal with over the past 3 years in New Jersey. Our fiscal year (FY) runs from July 31 to June 30 (e.g., FY96 runs from 7/95 to 6/96). The report shows 3 categories that have had substantial impact on our Section (i.e., contaminated waste/trash, contaminated metal and lost, stolen or abandoned devices). The report demonstrates that almost all of the contaminated waste/trash involve shorter lived radionuclides used in nuclear medicine procedures. The State of New Jersey's problem is that the Solid Waste Regulations do not allow radioactive waste that is regulated by the Atomic Energy Act to be disposed of at Solid Waste Disposal Facilities. Other states, I believe also have this problem. The problem may be resolved if we could receive a statement from NRC that **waste generated by patients after they had been released under 10 CFR 3 5.75 is not only considered as not licensed, but also not regulated by the Atomic Energy Act.** This might then allow the waste to be disposed of at landfills rather than have to be disposed of as radioactive waste.

The second point I would like to clear up is that it appeared that EPA is considering establishing a policy or criteria for determining when a radiation incident could qualify for some assistance. If we could be informed of EPA's policy or criteria for assistance, it would be most helpful. We're not looking to have EPA run out or pay to have someone run out and evaluate every radiation incident that takes place in our state. We will always respond to the incidents in our state. What we are looking for is a possible mechanism for covering the cost of disposal of the materials. Any guidance or assistance on this point would be appreciated. By the way, we have the CRCPD report on radioactive materials and devices sought for recycling, but so far none of the recovered sources qualified for recycling.

The third and final point I'd like to make is that perhaps NRC and EPA could jointly

generate a **Recommended Guide for Waste and Recycling Facilities to follow when their radiation monitors are triggered.** The guide could include some of the items discussed during the exercise (e.g., isolate the vehicle, mark off the area where exposures of > 2.0 mR/hr; contact appropriate officials, etc). This could supplement NRC's "Hazardous Scrap Metal" Poster with a few basic protective measures the facilities could do to minimize unnecessary exposure.

Tom Hughes, PEMA:

Because of the exercise, DEP ERT & BRP and PEMA were able to talk more on this type of response activity and this has already started a dialog. I was invited to the DEP Emergency Response Team Coordinators meeting in Williamsport PA next Wednesday to talk about PEMA's rad program and how we can work better with DEPs responders.

Tabletop Exercise Participant Comments

- Excellent exercise.
- Learned states in our region are very capable.
- Need more on decisions - less on organization.
- Need status boards.
- Too much jargon and acronyms - need to clarify.
- Learned lots.
- Would like to see this in all EPA / NRC Regions.
- Need more attention to public radiation exposure by participants.
- Need unified command discussion.
- Surfaced many issues my state needs to address.
- NRC / EPA / DOE joint participation made the exercise very valuable.
- Other state's experiences very valuable.
- Need to establish joint information center early on.
- Unified command discussion needed.
- Important to surface issues as well as solve them.
- Need more health physics considerations in exercise play.
- Need more attention to public health issues.
- Good discussion of federal resources available.
- Private industry groups need training on notification procedures.
- Early federal notification is important when it's suspected this is more then a nuisance event.
- There is fear on the part of the states that federal agencies might take over the incident, causing the state to lose control. This fear must be addressed.
- When states notify federal agencies, they need to clearly communicate what type of assistance and how much is requested.

Participant Ratings - Day One	
Was the format effective?	100% YES
Level of audience participation?	95% JUST RIGHT
Would you recommend participation to others?	100% YES
Did you learn anything useful?	100% YES

Average Participant Ratings of Phases of the Tabletop Exercise (1=Best, 5=Worst)	
Early Assessment	1.5
Notification	1.7
Initial Response	1.6
State and Federal Cooperation	1.9
Monitoring & Data Analysis	2.0
Breakout Session	2.0
Wrap up	1.9
Overall	1.6

Field Exercise Participant Comments

- Already starting new dialog within the state.
- Need more like it.
- Valuable insight gained.
- Never saw a recovery before - good experience.
- Overall a good learning experience.
- Very useful exercise - do more in other parts of the country.
- Want to keep involved in future exercises.
- Liked press briefings - develop follow up exercises.
- Tremendous learning experience - well planned - excellent facilitators.
- Include contractor role in the future.
- Federal agencies working together is long overdue.
- Very valuable exercise - already acting on ramifications.
- One of the most informative safety meetings
- Field demo resource intensive but worth it.
- Include citizens in command team.
- Far superior to part 1.
- Please do more non power-plant exercises.
- Would like a closer look at the field activity - perhaps TV monitor.
- Future exercises needed involving other states.
- Need to take to other EPA and NRC regions.
- Some observers would like to have seen the recovery team deliberations.

Participant Ratings:	
Was the field exercise a valuable experience?	100% YES
Level of audience participation?	90% JUST RIGHT
Would you recommend participation to others?	100% YES
What was most valuable?	
Morning activities	27%
Press briefings	27%
Field activity	46%
What was least valuable?	
Morning activities	35%
Press briefings	45%
Field activity	20%

Average Ratings of Phases of the Field Exercise (1=Best, 5=Worst)	
Opening / Overview	2.1
Unified Command discussion	2.1
Landfill / local government	2.1
State / NRC / EPA presentations	2.0
DOD & DOE presentations	1.9
Press conferences	1.9
Field simulation	1.8

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11. ABSTRACT *(200 words or less)*

This was the first major exercise of its type with the Environmental Protection Agency as the lead Federal Agency under the Federal Radiological Emergency Response Plan utilizing the resources of the National Contingency Plan. The Nuclear Regulatory Commission acted in a support role as the EPA utilized the unified command structure to support the needs of owner/operator, State and local organizations. The lessons learned provide valuable guidance for organizations encountering similar circumstances in the future.

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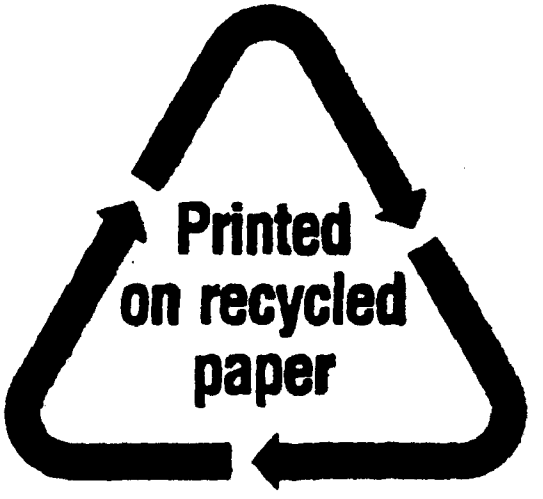

Federal Recycling Program