OSWER 88006

Guide to Exercises in Chemical Emergency Preparedness Programs

MAY 1988

U.S. ENVIRONMENTAL PROTECTION AGENCY

GUIDE TO EXERCISES IN CHEMICAL EMERGENCY PREPAREDNESS PROGRAMS

Foreword

This Guide has been prepared by the U.S. Environmental Protection Agency as a service to local and state chemical emergency response and planning authorities, including local emergency planning committees (LEPCs) and state emergency response commissions (SERCs) created pursuant to Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986. It consists of three Technical Assistance Bulletins previously distributed by EPA:

#1 Introduction to Exercises in Chemical Emergency Preparedness Programs

#2 A Guide to Planning and Conducting Table-Top Exercises

#3 A Guide to Planning and Conducting Field Simulation Exercises

For purposes of this Guide, each of these original bulletins has been revised to ensure comprehensive coverage and consistent format. In addition, a fourth section, providing example simulation exercise scenarios, has been added to complement the three bulletins.

The purpose of this Guide is to provide local and state officials with a self-contained manual for use in conducting a wide range of chemical emergency exercises. Many agencies have discovered that such exercises are an effective way both to test existing hazardous materials emergency plans and to identify priority concerns in developing new or revised plans. The resource materials provided here, as well as additional materials referenced herein, should enable emergency response and planning agencies to undertake exercises on their own.

PREPAREDNESS & PREVENTION
TECHNICAL ASSISTANCE BULLETIN #1

Introduction to Exercises in Chemical Emergency Preparedness Programs

U.S. ENVIRONMENTAL PROTECTION AGENCY

EPA PREPAREDNESS AND PREVENTION
TECHNICAL ASSISTANCE BULLETIN #1

INTRODUCTION TO EXERCISES IN CHEMICAL EMERGENCY PREPAREDNESS PROGRAMS

1. INTRODUCTION

In recent years emergency planners and managers have employed various types of exercises in the development and testing of contingency plans and response capabilities for a wide range of emergencies. A number of these exercises have been conducted with the support of federal agencies such as the Environmental Protection Agency (EPA), the Federal Emergency Management Agency (FEMA), and the United States Coast Guard (USCG), as well as with the support of private industry, especially through the efforts of the Chemical Manufacturers Association (CMA).

Many communities have reported that they are confused by the existence of the various types of exercises and are often unsure as to which type(s) of exercises will meet their needs. This Technical Assistance Bulletin provides an overview of the major exercise types and describes some resources currently available for conducting exercises.

2. AN OVERVIEW OF EXERCISES

The first section of this overview includes a discussion of the essential elements of exercises, differences among major exercise categories, descriptions of hypothetical exercises, and the use of exercises in the planning process.

2.1 The Essentials Of Emergency Exercises

A chemical emergency exercise is a distinctive type of directed activity with the following essential elements:

- The triggering event of the exercise is a simulated hypothetical accident that generates problem(s) for participants;
- The participants are representatives or principals of some, most, or all of the major organizations that would respond to an actual emergency, including first responders, HAZMAT teams, medical personnel, public works personnel, emergency services officials, city managers, and elected officials;
- The participants solve the problems presented to them by using existing plans and operating procedures, activating emergency response systems, and/or deploying equipment;
- Problems are presented sequentially and each problem requires some type of response by the participants, whether it be in the form of discussion, written messages, and/or actions; and

- These responses are related to one or more emergency activities (e.g., coordination of various response units, fire suppression, emergency medical services).

Following the exercise the participants are debriefed, and a summary and critique of the exercise are prepared.

2.2 Differences Among Exercises

In addition to the shared exercise elements listed above, there are important differences among the various types of exercises that can be employed in emergency preparedness. Exercises can have differences in purpose, scope, level of stress, and types of responses or actions required of participants:

Purposes. The purposes of emergency exercises range from training and familiarization of participants with their roles and responsibilities to a rigorous test of contingency plans and response capabilities.

Scope. By scope of the exercise is meant the number of functions to be exercised and/or the depth to which the functions are examined. Among the functions that can be exercised are prevention and control, warning, incident assessment, and containment. (See **Exhibit 1** for a list of major emergency response functions.) Exercises can deal with one, several, or all functions and/or some or all of the activities associated with each function.

Stress. Exercises impose varying degrees of stress on participants. In low-stress exercises, participants are given fairly simple problems and ample time to solve them. In high-stress exercises the problems are numerous, complex, and presented in real time.

Actions. Participants in an exercise may be asked to respond orally to problems (e.g., to discuss responses or actions that they might take, and/or verbally "walk through" a process); simulate actions that they would take without actually deploying personnel and equipment to the scene of an accident (e.g., activate the communication system, provide technical assistance); or simulate all actions that they would take in an emergency, including those at the scene of an accident.

Exercise planners create different types of exercises by combining the variables of purpose, scope, stress, and actions in different ways.

2.3 Major Exercise Categories

There are three major categories of exercises -- table-top, functional, and field, each of which is described below. A list of the exercises and their sponsors is presented in **Exhibit 2**. Because the various agencies that sponsor exercises do not use consistent terminology to describe the various types of exercises, the subcategories in Exhibit 2 indicate some of the names used by different sponsoring agencies. While this list is representative of the types of chemical incident exercises available to states and local communities, it is by no means exhaustive.

EXHIBIT 1

List of Major Emergency Response Functions[1]

Initial Notification of Response Agencies

Direction and Control

Communications (among responders)

Warning Systems and Emergency Public Notification

Public Information/Community Relations

Health/Medical Services

Response Personnel Safety

Human Services

Personal Protection of Citizens (Indoor Protection, Evacuation)

Fire and Rescue

Law Enforcement

On-going Incident Assessment

Resource Management

Public Works

Containment and Cleanup

Documentation and Debriefing

---

[1] This list of functions, compiled from the National Response Team's Hazardous Materials Emergency Planning Guide, is not intended to suggest priorities among activities.

EXHIBIT 2

Exercise Types Employed by EPA, FEMA, USCG and CMA

	Sponsoring Organizations			
EXERCISE TYPES	**EPA**	**FEMA**	**USCG**	**CMA**
Table-Tops	x	x		x
Functional				
Functional		x		
Emergency Operations Simulation				x
OSC/RRT (Yorktown)			x	
Field				
Drill				x
Field				x
Full-Field	x			
OSC/Local			x	
Full-Scale		x		

Table-top Exercises. The first category of exercises is the "table-top." The distinctive characteristic of the participant action in all table-top exercises is "talk," which may range from informal responses to questions about emergency situations to a verbal "walk-through" of procedures and processes.

"Table-tops" are generally low-stress activities. They are usually held for the purpose of training or familiarizing participants with plans and procedures. They may differ significantly in scope, however. Any given table-top may focus on one, several, or all of the major response functions. They may also differ in the depth to which each function is exercised. The principal output of a table-top is to highlight problems in broad response categories, such as communications or traffic control. Procedural training and equipment problems show up more so in the field exercises.

As shown in Exhibit 2, the specific types of exercises in this category include:

- EPA's Table-top Exercise;
- FEMA's assistance for Table-top Exercise; and
- CMA's Table-top Exercise.

(See Technical Assistance Bulletin #2 for a more detailed discussion of table-top exercises.)

Functional Exercises. The second major category of exercises is the "functional exercise", i.e., a simulated exercise with no actions in the field. The dominant feature of this category is the actual performance of some or all of the actions that would be required of participants in an actual emergency, except those activities that are performed at the scene of an accident. These functions could include the activation of emergency systems, such as warning or communications systems.

Functional exercises tend to have moderate to high stress. Often they focus on a single function (e.g., direction and control, providing technical assistance to responders). Their purpose is generally to test planning and response capabilities of personnel and systems without actually deploying response equipment.

As shown in Exhibit 2, the exercises in this category include:

- FEMA's Functional Exercise;
- U.S. Coast Guard's OSC/Regional Response Team Simulation; and
- CMA's Emergency Operation Simulation (EOS).

Field Exercises. The third major category of exercises is the "field exercise". The dominant participant activity in field exercises consists of response operations conducted at the site of a simulated emergency.

Field exercises involve all or most of the emergency response functions. The common purpose of field exercises is to provide a rigorous test of emergency capabilities of the total emergency response system. Response equipment is deployed, realistic scenarios are used, medical personnel and equipment including operating rooms are included, and plant managers and other industry employees are participants. Because these events involve key community groups and agencies, these exercises often elicit media attention.

As shown in Exhibit 2, the exercises in this category include:

- EPA's Full-Field Exercise;
- FEMA's Full-Scale Exercise;
- CMA's Drill and Field Exercises; and
- USCG's OSC/Local Response Team Exercise.[2]

2.4 Descriptions of Hypothetical Exercises

The following capsule descriptions of a hypothetical chemical emergency exercise for each of the three categories may help illustrate the differences among these categories. These descriptions are in the form of brief "information bulletins" that might be issued by officials of a hypothetical "Lake City" following the conclusion of each exercise. These descriptions provide information on the purpose, participants, location, scope, and activities of exercise participants.

Table-Top. During a recent table-top exercise, officials of Lake City reviewed the city's plans for responding to a major chemical emergency. Senior managers of the police and fire departments, the city's new Hazardous Materials Team, a representative from the Red Cross, a local hospital liaison, and the field commanders of all major response units conducted informal discussions of actions that their units would have taken if this had been an actual emergency. Their discussions covered the full range of required responses to such an emergency. A brief evaluation or "lessons learned" period followed the exercise.

Functional Exercise. Officials in Lake City report the completion of a major test of the city's capabilities to provide emergency medical services to affected populations following a major leak of a highly toxic chemical. The test focused on the local Bayfront Chemicals plant on Bay View Avenue and nearby neighborhoods. Participants in the exercise included the City's Emergency Services Director, officials of the public health department and Bayside Hospital, and medical emergency units from the fire department. Emergency activities of interest in this test included the coordination of responses, the management of resources, and the identification of medical requirements arising from such an emergency. Participants simulated the activation of the emergency warning system and the city's new emergency medical response system. The major activities were conducted from the

---

[2] This exercise may also be a "functional exercise." For purposes of this analysis, we have listed it as a "field exercise."

operations center in City Hall. An evaluation was conducted by key participants following the exercise.

Field Exercise. City officials announced today the completion of a major test of the city's new emergency operations plan for chemical accidents. The test involved all the major offices and departments of the city with responsibilities under the plan, including the mayor's office, and the police, fire, medical, public health and emergency services departments as well as a representative from the Salvation Army and the Red Cross. All aspects of emergency response were tested, including direction and control by officials in the emergency operations center (EOC), coordination of all operations at the site of the simulated accident (the local plant on Lakeview avenue), and all operations required to suppress the simulated leak and treat all affected persons in the plant and the nearby residential area. An extensive debriefing was held and an evaluation of the exercise will be prepared. Following the evaluation, officials will revise the city's emergency plan and operating procedures.

3. USE OF EXERCISES IN THE PLANNING PROCESS

The Hazardous Materials Emergency Planning Guide, recently issued by the U.S. National Response Team (NRT), suggests that local planning teams[3] complete four major tasks:

- Review existing plans;
- Assess current response capabilities to respond to chemical emergencies;
- Develop an emergency response plan for chemical accidents; and
- Revise, exercise, and update the plan.

The "exercises" referred to in the fourth task can be useful in the completion of the other planning process tasks as described below.

Reviewing Existing Plans. Exercises provide insight into how response functions would actually be carried out under an existing plan. An existing contingency plan can be tested by presenting exercise participants with a simulated chemical accident requiring a simulated response based on the provisions of the local plan. Use of an exercise is often more effective in many cases than a review of the plan by a single planner. Exercises also are useful in obtaining input and expertise from a variety of people from different agencies, rather than from a single planner or set of planners. Field exercises provide the most complete review, and they are most useful when plans are relatively complete and formal. Table-top exercises can be used effectively in communities where resources are limited or existing plans are less complete. The results of these exercises can be used to revise and improve plans which lack sufficient provisions for chemical emergencies.

---

[3] These planning teams may be either a local emergency planning committee (required by Title III of SARA) or other local authorities.

Assessing Capabilities. Assessment of current capabilities is a major task for any planning team. An assessment:

- Identifies gaps in resources and readiness that need to be addressed in the planning process;
- Produces an inventory of response resources within a community (e.g., chemical containment equipment, fire apparatus, hospital beds); and
- Identifies the level of preparedness of emergency response units and systems in the event of serious chemical accidents.

This assessment can be done through exercises designed specifically to test current capabilities. Exercises can uncover potential capabilities and weaknesses that are often overlooked by other methods.

Developing, Revising or Updating the Plan. One of the basic principles of emergency planning is that each planning team needs to design its contingency plans to fit local circumstances. All of the elements of the plan (e.g., required procedures, policies, coordination mechanisms) need to be specifically related to the existing resources, capabilities, and organizational structure for the given community or emergency planning district. An exercise is a very useful way to identify gaps in existing emergency response procedures or to determine planning factors necessary for developing specific plans for chemical emergencies. In addition, an exercise can be a powerful stimulus for building interest in developing a comprehensive local emergency plan.

4. AVAILABLE RESOURCES FOR CONDUCTING EXERCISES

This section of this Technical Assistance Bulletin includes a description of resources available for conducting exercises from the Environmental Protection Agency, Federal Emergency Management Agency, U.S. Coast Guard, National Oceanic and Atmospheric Administration, Chemical Manufacturers Association, and the National Response Team.

4.1 Environmental Protection Agency (EPA)

EPA provides training as well as technical assistance to develop and deliver table-top and field exercises. This assistance is offered through EPA Headquarters, Regional Offices, or through EPA's Environmental Response Team (ERT). In the case of joint EPA/FEMA training, the training is coordinated by FEMA's Emergency Management Institute located in Emmitsburg, Maryland.

EPA Headquarters. EPA Headquarters provides contractor support to EPA Regional Offices to conduct table-tops and field exercises in priority areas designated by the Regions in consultation with the States. Support for these exercises is coordinated by EPA's Regional Preparedness Coordinators.

EPA Headquarters provides periodic Technical Assistance Bulletins such as this one, designed to provide technical information relevant to chemical emergency preparedness and prevention. Current Bulletins can be obtained from the EPA Regional Preparedness Coordinator.

EPA Regional Offices. EPA's Regional Offices will provide States and communities in designated priority areas with the following assistance:

- Programmatic and technical assistance to help communities determine the steps to follow in conducting an exercise;
- Facilitation assistance for both table-tops and full-field exercises; and
- Coordination of EPA Headquarters and Regional Office resources to assist States.

This assistance is provided to States and communities upon request to the EPA Regional Preparedness Coordinator. (See Technical Assistance Bulletin #3 for the addresses of all EPA Regional Offices.)

EPA's Environmental Response Team. The Environmental Response Team (ERT) provides technical assistance in developing and conducting full-field hazardous materials exercises. This support includes developing scenarios, working with EPA Regional Training Coordinators to provide assistance to the States and local communities in determining appropriate limitations of the exercise, serving as facilitators/evaluators during the exercise, and providing support in critiquing the exercise at the debriefing session following the exercise. ERT provides this assistance upon request from the EPA Regional Preparedness Coordinators or Regional Training Coordinators. (The ERT can be contacted at (513) 569-7537.)

4.2 Federal Emergency Management Agency (FEMA)

FEMA provides exercise training courses, as well as direct assistance for personnel, training, and support materials to aid jurisdictions in developing and coordinating their own exercises. (See Technical Assistance Bulletin #3 for the addresses of FEMA Regional Offices.)

FEMA's Exercise Training Courses. FEMA conducts classroom and field exercise training at the Emergency Management Institute (EMI) and at the State level. Using the EMI facility located in Emmitsburg, Maryland, FEMA delivers 12 to 14 exercises each year in the classroom as part of their Exercise Design Course (train-the-trainer) and the Integrated Emergency Management Course. Other FEMA emergency management courses, such as the Radiological Emergency Preparedness Planning Exercise Evaluation Course, also contain material useful in developing an exercise program, conducting exercises, and evaluating exercises. Additionally, FEMA provides instructor guides, student manuals, and resource manuals for resident and field courses.

FEMA's Comprehensive Cooperative Agreement (CCA) mechanism provides funding for State and local attendees in the field. For access to these courses, contact the appropriate State Emergency Response Commission or the FEMA Regional Office.

FEMA's Exercise Assistance. All State and local jurisdictions receiving FEMA funds through the CCA must exercise their emergency operations plans and procedures annually. Each jurisdiction must submit as part of its annual CCA statement of work an updated 5-year exercise plan. At least one full-scale exercise must be conducted during the 5 years, and a functional exercise is to be held in each of the other 4 years. Exercise scenarios must be rotated among national security, natural, and technological hazards. The exercise focus is on multi-agency and intergovernmental involvement as well as public and private interaction.

Technical assistance is provided through a State Exercise Assistance Officer (100 percent FEMA-funded) and FEMA Regional Office Hazardous Materials Program staff for scenario development, pre-exercise training, and post-exercise evaluation. For information on upcoming exercises involving hazardous materials, contact the FEMA Regional Hazardous Materials Program staff or the Regional Training and Education officers.

FEMA Exercise Support Materials. FEMA furnishes a variety of exercise support materials, including a computer-aided exercise generator and an exercise library containing a variety of exercises developed by State and local jurisdictions. The computer-aided exercise generator covers a number of different scenarios: hazardous materials accident, nuclear power plant accident, flood, winter storm, earthquake, tornado, mass casualty, and nuclear attack. The generator has been incorporated into software packages, enabling the user to design different exercise patterns by varying the objective and timeframe. For more information, contact your State Emergency Management Agency or FEMA Regional Office.

4.3 United States Coast Guard (USCG)

The USCG annually conducts six On-Scene Coordinator (OSC) and Regional Response Team (RRT) simulation command post exercises. These simulations focus on specific issues of concern to the OSC and RRT and are designed to exercise the relationship among the pre-designated OSC, the RRT, and response coordinators of Federal, State and local agencies with responsibility for oil and hazardous chemical pollution. Representatives of potential pollution sources (i.e., truck, rail, vessel and facilities) and cleanup contractors are also included. (For information contact the USCG at (202) 267-2010.)

4.4 National Oceanic and Atmospheric Administration (NOAA)

The National Oceanic and Atmospheric Administration provides reports and critiques on its past field simulation exercises. (These materials are available by contacting the Hazardous Materials Responses Branch, Ocean Assessment Division of NOAA at 206-526-6273 or FTS 392-6273.)

4.5 National Response Team (NRT)

The NRT has recently published the Hazardous Materials Emergency Planning Guide to assist local planners in preparing emergency plans. This guide includes a description of the materials that should be included in a local emergency plan and provides a sample outline of a plan. The guide identifies exercises as a principal method for testing, revising, and updating plans. (Copies of the Guide can be obtained by contacting the EPA

Regional Office or the Chemical Emergency Preparedness Program Hotline at (800) 535-0202 or (202) 479-2449.)

4.6 Chemical Manufacturers Association (CMA) Exercise Assistance

CMA members have conducted several simulation exercises through CMA's local Community Awareness and Emergency Response (CAER) programs. These exercises involve local industry and response officials (e.g., fire, police, Red Cross) and are often videotaped. CMA provides these and other tapes through their lending library. Funding for exercises is at the discretion of the local CAER coordinator and/or the sponsoring facility. (Contact the CMA hotline (202-463-1599) for additional information on exercises and the CAER program.)

PREPAREDNESS & PREVENTION
TECHNICAL ASSISTANCE BULLETIN #2

A Guide to Planning and Conducting Table-Top Exercises

U.S. ENVIRONMENTAL PROTECTION AGENCY

EPA PREPAREDNESS AND PREVENTION
TECHNICAL ASSISTANCE BULLETIN #2

A GUIDE TO PLANNING AND CONDUCTING TABLE-TOP EXERCISES

1. INTRODUCTION

This guide provides a process for planning, conducting, and evaluating a table-top exercises. More specifically this guide:

- Describes a set of specific preparatory steps that can be followed by any community desiring to use a table-top exercise to advance its own emergency preparedness;
- Offers guidelines for use in conducting a table-top exercise;
- Recommends methods for debriefing participants and evaluating the exercise; and
- Provides a description of a hypothetical table-top exercise held in "Lake City" and the Lake City exercise control materials.

The distinctive characteristic of the participant action in all table-top exercises is "talk," which may range from informal responses to questions about emergency situations to a verbal "walk-through" of procedures and processes. Table-tops are generally low-stress activities. They are usually held for the purpose of training or familiarizing participants with plans and procedures. They may differ significantly in scope, however. Any given table-top may focus on one, several, or all of the major response functions (e.g., coordination, evacuation, emergency notification). They may also differ in the depth to which each function is exercised.

To give readers an example of materials prepared for and used in a table-top exercise, this general discussion is preceded by a brief summary of the table-top exercise held in "Lake City" (a pseudonym). The Lake City table-top exercise was a half-day event held in a conference room at the offices of a regional planning commission. The primary objective of the exercise (described more fully in **Appendix A** was to gain experience and insights that could be used to advance the chemical emergency planning process in the city. The participants were managers of the first line emergency response units of Lake City and neighboring jurisdictions, including representatives of police and fire departments and emergency medical services, a plant manager, a Red Cross representative, and other key community personnel. During the play of the exercise ("play" refers to the step-by-step execution of a table-top), the participants verbally responded to a sequence of events associated with a major chemical accident by describing the typical response actions that would occur in the event of a real emergency. Subsequently, they evaluated the exercise to identify preparedness and planning needs that Lake City was beginning to address in the development of its first hazardous materials accident contingency plan. (The materials used to conduct the Lake City table-top are provided in **Appendix B.**)

2. MAJOR STEPS IN DEVELOPING A TABLE-TOP EXERCISE

The following discussion outlines the essential steps to be completed by those responsible for planning the exercises. (The order in which these steps are presented is suggestive only. Completing all of these steps is more important than following the prescribed order.) These steps include:

- Describe the emergency response system to be exercised;
- Develop a clear statement of the general objectives of the exercise;
- Use the statement of objectives to define the scope of the exercise;
- Present the results of the first three steps to the leadership of the necessary participating organizations (if they are not members of the exercise planning team) in order to secure their approval and commitments of participation;
- Define the critical features of the accident to be simulated;
- Decide on the identity of all the table-top participants;
- Deter[illegible] the identity and responsibilities of key persons who will [illegible]st in conducting the exercise;
- Decide on the ground rules to be followed in the conduct of the exercise;
- Arrange for all the logistical requirements, including space, exercise materials, and seating arrangements; and
- Develop the exe[illegible]cise materials.

In this discussion we assume that an exercise leader or a coordinator of the team effort has been designated by the local planning committee and that all of the major steps are completed in concert with the key officials concerned with preparedness and response. Although table-tops vary in their complexity, they all require planning and coordination. It is critical that problems that arise reflect genuine response capability problems, rather than problems that may be due to a haphazardly planned and coordinated exercise process.

Step 1: Describe the emergency response system to be exercised

The description of the emergency response system should contain, at a minimum, the following:

- A listing of all the major response agencies, e.g., fire, medical and police departments, and HAZMAT team;
- The emergency response roles and responsibilities of these agencies; and

- How the system would respond to a major chemical accident.

It is important to understand how the emergency system operates. To accomplish this, the exercise leader or coordinator should: (1) consult all available plans, procedures, agreements, etc., of the responsible agencies; (2) review prior exercises and reports on responses to past accidents; and (3) hold informal discussions with representatives of the major response units. It is not necessary for the system to be outlined in formal plans and procedures for this step to be completed. If formal plans do not exist, the exercise leader should identify the informal system of operating procedures that typically have governed response to previous incidents.

Step 2: Develop a clear statement of the general objectives of the exercise

Virtually all table-top exercises for chemical emergencies have the common objective of testing the capabilities of a jurisdiction's emergency system to respond to a chemical accident threatening public health and safety. To this generic objective might be added something about the type and size of the accident or the emergency response functions to be tested. For example:

> "The objective of the exercise is to test the capabilities of the City's police and fire departments and emergency medical service units to respond to a major chemical accident at a fixed facility in the City and to minimize the effects of that accident on public health and safety."

Step 3: Use the statement of objectives to define the scope of the exercise

The scope of the exercise refers to the number and identity of response functions to be exercised and the depth to which any of the functions will be examined. For example:

> "The exercise will test the procedures for dispatching response personnel, containing an accident, and treating on-site injuries."

Table-tops can deal with a single function, multiple functions, or all of the functions required for a major response.

Step 4: Present the results of the first three steps to the leadership of the necessary participating organizations (if they are not members of the exercise planning team) in order to secure their approval and commitments of participation

This may be an interactive process requiring the revision of some of the results of the first three steps.

Step 5: Define the critical features of the accident to be simulated

Once the general objectives and scope of the exercise have been agreed upon, three specific features of the exercise should be determined:

- The nature of the accident which poses the threat;
- The facility or transportation route where the accident is to occur; and
- The characteristics of the neighborhood(s) threatened by exposure to accident effects.

One or more of these features may be dictated by the general objective of the exercise and/or by its scope. The exercise scenario should be realistic and specific to the kinds of releases a particular community is likely to experience. For example, the objective provided in Step Two (i.e., "...to test the capabilities of the city's police and fire departments and emergency medical service units to respond to a major chemical accident...") requires an exercise accident that causes injury to workers in the facility or nearby citizens. Otherwise there would be no problems for which emergency medical services are called. Likewise a decision to test multiple functions, as illustrated in Step Three, leads to the requirement that the accident be complex enough to require the response of different units of the community's emergency system, each of which may be responsible for a different function.

Step 6: Decide on the identity of all the table-top participants

The participants should include the directors of the various units (e.g., police, fire, Red Cross) that would be dispatched to an actual emergency of the type being simulated in the exercise, as well as local officials (e.g., mayor, city manager), and local plant representatives.

Step 7: Determine the identity and responsibilities of key persons who will assist in conducting the exercise

Persons assisting in conducting the exercise may include:

- A facilitator, who will introduce the exercise events into the "play" of the exercise and facilitate the completion of responses;
- A recorder, who will take notes during the exercise and collect materials; and
- Observer(s)/evaluator(s), who will observe and evaluate the play of the exercise.

Collectively these persons constitute the exercise control group.

Step 8: Decide on the ground rules to be followed in the conduct of the exercise

Table-tops are conducted most effectively under a clear set of ground rules. These rules typically control such matters as actions expected of the participants, how their decisions are to be reported to other participants and to the exercise control group, and the length of time to be allocated in responding to each event. It is crucial that these be developed in advance of the exercise and understood by the control group and the participants. (See **Appendix C** for an example set of table-top ground rules.)

Step 9: Arrange for all the logistical requirements, including space, exercise materials, and seating arrangements

All arrangements should be checked by a member of the exercise planning team, who is designated as the exercise coordinator, to make sure that they will support the exercise design. An improperly configured conference room can make the conduct of a table-top very difficult, as can the lack of key exercise materials such as maps and copies of plans. It can be very helpful to have a large map showing the accident site, the surrounding neighborhoods, and key public facilities such as schools, hospitals, and potential evacuation facilities.

Step 10: Develop the exercise materials

The exercise materials consist of three parts:

- The scenario which sets the stage for the exercise;
- A sequence of events, which stimulates the play; and
- Anticipated responses.

The exercise material used in the Lake City Table-top Exercise is provided in **Appendix B**. The **scenario** is a brief written statement that provides an overview of the emergency situation. The scenario should contain the following:

- A brief description of the community, the facility, and the area surrounding the facility;
- A description of the chemical accident that is the triggering event for the exercise; and
- Any other information that is important to the setting for the first event in the sequence of events (e.g., the wind conditions at the time of the accident, casualties, and the exact location of the accident).

The **sequence of events** is presented to the participants, either orally or in writing one event at a time. The events are arranged in a logical and chronological sequence designed to portray the essentials of a developing

emergency situation. The events represent changes in the circumstances of the accident or in conditions over which the participants have no control, e.g., a change in the weather or a major change in the rate of spill or leakage of the chemical.

The events in this sequence should be:

- Directly relevant to the response functions being exercised, the roles and responsibilities of the participants, the exercise objectives, and the locale of the accident;
- Tailored to the specific characteristics of an actual facility and the community in which the accident occurs; and
- Realistic, factual, and arranged in the proper sequence.

In selecting the events for the exercise, the exercise coordinator will find it useful to construct a set of **anticipated responses** tied to the various events. These anticipated responses can be used by the exercise facilitators and evaluators as a standard against which to compare actual responses during the table-top. These standards are <u>not</u> shared with exercise participants in order to ensure realistic responses. Anticipated response actions may be derived from relevant contingency plans or standard operating procedures used by one or more of the participating organizations. If plans or procedures do not exist, the anticipated response measures should be developed and written down prior to the exercise, constructed logically from the circumstances being simulated, or identified through discussions with response personnel regarding their informal operations procedures.

An example of an exercise event and an anticipated response follows:

Exercise event: Flow of chemical continues at rapid rate.

Anticipated response: First responders on the scene confer with the plant manager on the identity of the chemical.

Even if no intervention is required during the exercise, the process of developing anticipated responses will be valuable to the designer of the exercise events. The set of anticipated responses will provide a useful framework for discussion during the post-exercise evaluation session.

3. GUIDELINES FOR CONDUCTING THE EXERCISE

The major preparatory steps discussed above set the stage for a smooth conduct of the exercise by the exercise facilitator. On the day of the exercise, the facilitator must assume direct responsibility for the conduct of the exercise to ensure adequate accomplishment of its objectives. The facilitator's job is to:

- Describe the ground rules for the exercise, including the roles that the various participants are to play;
- Present the players with the exercise narrative;

- Announce the first event of the scenario;
- Stimulate player responses, without intervening in a way that assumes control of the play, unless it appears likely that the players will not initiate a response critical to the objective of the exercise;
- Control the flow and pace of the exercise by introducing the remaining events in sequence; and
- Keep the exercise on schedule and terminate play at the specified end time.

In general, it is best to let the exercise play develop naturally, with participants responding to prescribed events as they deem appropriate. However, some anticipated responses may be so critical to the purposes of the exercise that the exercise facilitator will have to intervene in the play to assure that they take place. (The fact that such intervention is required will, of course, represent a very important lesson for the exercise participants and should be noted for further discussion in the post-exercise debriefing and evaluation.) An example would be the activation of an evacuation process during an exercise whose objectives include testing the community's evacuation plan. (**Appendix D** provides a lengthy "checklist" of suggestions for the successful conduct of table-top exercises.)

4. GUIDELINES FOR CONDUCTING A POST-EXERCISE DEBRIEFING AND EVALUATION

A post-exercise debriefing and evaluation can be as valuable an experience as the exercise itself. These post-exercise sessions are critical for capturing the lessons of a table-top so that they can be used to revise and improve emergency plans and procedures. The facilitator should first conduct a debriefing session, whose primary objective is to review the experiences of the participants during the exercise. A debriefing works best if the facilitator leads the participants through an event-by-event recapitulation of the exercise, discussing the actual responses and how they compared to anticipated responses. The debriefing may cover all events and responses before they are evaluated, or it may proceed one event at a time, allowing an opportunity for evaluation as well.

Once the debriefing is completed, the facilitator should elicit evaluations from the participants concerning both their own performance during the exercise and the characteristics of the exercise as a whole. This process will be enhanced if the participants understand that the purpose of the evaluation is to develop a set of recommendations for improving the response system, rather than to find fault with the performance of the participants. These recommendations may include actions to improve emergency response plans, procedures, and equipment as well as additional training needs for members of the response system.

It is important that problems in the response system (e.g., lack of plans or procedures) be separated from problems related to the specific exercise design or conduct (e.g., a scenario event that did not match conditions in the community). Thus the facilitator should allow opportunity

for the participants to evaluate the exercise itself. The facilitator should be alert to both the possibility that participants may be more critical of the exercise than of their own performance and the fact that problems with exercise design and conduct may have produced some responses that do not reflect existing plans, procedures, or the response capabilities of the participants.

5. IMPROVING RESPONSE PREPAREDNESS FOLLOWING THE EXERCISE

The results of the debriefing/evaluation period, especially the remedial actions, need to be implemented by the response system in order to take maximum advantage of the table-top experience. These results should be included in the on-going planning and preparedness activities of the community. Local planners should initiate efforts to revise existing plans and procedures or develop new ones to reflect the lessons from the exercise (e.g., revise notification procedures, clarify responsibilities for providing services to an evacuated population.) Exercise planners should use the evaluation of the exercise itself to improve future exercises. All other parties (e.g., police, fire, emergency, medical) should take actions appropriate to their roles in the preparedness effort. Approximately three to six months following the exercise, the contingency plans and procedures should be reviewed to ensure that appropriate changes and revisions were incorporated.

LIST OF APPENDICES

Appendix	Title
A	Lake City Advances Preparedness Through Table-Top Exercise
B	Lake City Table-Top Exercise Control Materials
C	Example Table-Top Exercise Ground Rules
D	Suggestions for the Conduct of Table-Top Exercises

APPENDIX A

LAKE CITY ADVANCES PREPAREDNESS THROUGH TABLE-TOP EXERCISE

Introduction

On July 30, 1986, emergency response personnel from Lake City, Middletown, and Plainville, gathered at the offices of the Regional Planning Commission (RPC) to participate in a table-top Chemical Emergency Preparedness Program (CEPP) exercise. Also present were representatives of the State Police, the State Department of Environmental Protection, RPC, the American Red Cross, the Salvation Army, Lake City Bus Transit, Lake City Air Quality Control, various chemical industries, EPA Headquarters staff, and EPA Regional staff. The immediate purpose of this exercise was to test and improve the response capabilities of Lake City's municipal agencies; another, longer-range objective was to provide impetus toward the development of a chemical emergency contingency plan for Lake City.

Extensive preparatory activities had preceded the table-top exercise. This bulletin briefly discusses these activities as well as the broader context of chemical emergency preparedness in Middle County. The purpose of this bulletin is to share with other communities the "lessons learned" in Lake City, with the hope that those lessons will contribute to successful table-top exercises and related contingency planning efforts elsewhere.

Background

Lake City, located in Middle County, is a medium-sized industrial city. Lake City is home to numerous chemical, oil, steel, and other industrial facilities. Although Lake City's police, fire, and emergency medical departments have been called upon to respond to numerous small-scale transportation-related hazardous materials incidents, and although the Lake City Fire Department has developed formalized procedures for so-called "hazmat" incidents, no comprehensive contingency plan has yet been developed. Among area jurisdictions, Lake City is not alone in this circumstance. Recognizing this situation, RPC has spearheaded the formation of a Middle County Hazardous Materials Task Force.

Preparatory Activities

EPA released interim guidance for its Chemical Emergency Preparedness Program (CEPP) late in 1985. The CEPP coordinator for EPA Region ZZ, decided that the Middle County area would be a suitable location for a case study of how CEPP guidance could be implemented at the local level. An RPC official meanwhile, saw the CEPP initiative as one way to foster cooperation and communication among various jurisdictions that faced potential chemical incidents from fixed facility releases and/or transportation accidents. The Safety, Health, and Environmental Director at the XYZ chemical plant in Lake City, offered use of plant grounds for a field simulation of a hazardous chemical incident to which nearby cities and towns could respond.

Meetings at RPC involving various interested parties revealed that Middletown had recently developed and tested an emergency response plan. Other jurisdictions and industries in the area have informal cooperative

agreements to assist each other during emergencies, but those agreements are not written into contingency plans. Two counties bordering Lake City have hazmat teams, as does the City of Middletown.

In 1986, EPA Regional officials held a series of meetings with interested parties to take more formal steps toward a field simulation exercise. Because adequate written contingency plans were not yet available, officials agreed that a carefully-planned table-top exercise should precede a field simulation. It was also agreed that, because the XYZ company's facility is located in Lake City, active cooperative leadership from Lake City officials would be essential to the success of any exercise. Lake City political leaders voiced their support for the proposal and the Deputy Police Chief agreed to lead the planning effort.

In 1986, emergency response and safety personnel from cities and chemical plants in the Lake City area were interviewed. The purpose of these interviews was to determine the existing response procedures in order to assure that the exercise scenario would present a realistic test of local response capabilities and practices.

A one-page accident scenario narrative was developed and circulated for comment by interested parties in the Lake City vicinity. Potential participants were invited by EPA and RPC to be present. After the proposed narrative was approved, an exercise "script" was developed, in the form of a sequence-of-events that might realistically be expected to occur following the accident described in the narrative.

The Table-Top Exercise

Exercise participants and observers met at 8:30 a.m. Everyone introduced him/herself. Ground rules for the exercise were announced. Among the significant ground rules were the following:

- Participants would "enter" the exercise, as specific events in the script unfolded, to represent those parties who would be involved in a response if the event were a real one;
- For each event, the appropriate participants would describe fully the actions that they would take in response;
- Because the exercise was especially meant to test the response capabilities and procedures of Lake City and neighboring jurisdictions (rather than the safety procedures of local chemical plants), industry representatives were not participants in the table-top; instead, realistic industry reactions were "built-into" the exercise script; and
- Exercise facilitators could call a time-out in the exercise whenever technical advice or information was needed to assure the fidelity of the simulation.

Each individual event was projected onto a screen by an overhead projector while participants described response procedures. A recorder summarized the

responses on large paper pads for use in future review and evaluation of the table-top. The simulation began at about 9:00 a.m. and lasted approximately two hours.

After a fifteen-minute recess all participants and observers reconvened to discuss the exercise. This discussion was not meant to produce a decision about the quality of the simulation exercise, nor to judge the appropriateness of the response decisions that had been made by the participants. Instead, the purpose of the discussion session was to have everyone identify issues that must be faced by area planners preparing for possible hazardous materials incidents. In this way, the table-top became a direct input into Lake City's ongoing contingency planning process.

The major planning issues identified concerned the need to develop evacuation procedures and to improve formal coordination of and communication among area emergency responders. Participants noted a general emergency personnel shortage in the area. These issues and their constituent sub-issues were written down during the discussion session and will be revised over time. It is intended that this list serve in effect as a contingency planning agenda once the field simulation has been completed.

Next Steps

Participants agreed that the next step is to constitute a planning committee, including representatives from each major Lake City emergency response agency, to develop plans for a field simulation. The ultimate end of Lake City's exercise effort, however, will be the completion of a contingency plan which will guide future exercises as well as, in the event of a real chemical emergency, future response actions.

Lessons Learned

Although Lake City's response officials are, as of this writing, still in the early stages of the contingency planning process, a few lessons can clearly be discerned from the Lake City experience to date:

- Active local leadership is key to the successful planning of chemical emergency response exercises and the development of contingency plans. In Lake City, the leadership of the Deputy Police Chief and RPC staff has been instrumental in carrying process this far.

- Close cooperation with local chemical plant officials is also very helpful. In Lake City, the XYZ Company's representative took an early lead both within the Middle County Hazardous Materials Task Force and in volunteering XYZ's plant site for the field simulation. Moreover, his technical knowledge will prove essential as Lake City turns its attention from the field simulation to contingency planning.

- Although there is wisdom in the conventional approach of developing a contingency plan prior to undertaking response exercises, experience in Lake City clearly demonstrates that table-top exercises can usefully precede the planning effort. They can serve both as motivators of the planning process (by

getting people energized to deal with demonstrated response weaknesses) and as substantive guides to the specific issues and problems the community needs to address in that process.

- Emergency response exercises in one locality can help raise awareness and motivate hazmat planning over a broader geographic area. In the case of Lake City, the table-top exercise attracted county-wide participation and interest and has provided an impetus to similar efforts in neighboring jurisdictions.

APPENDIX B

LAKE CITY TABLE-TOP

EXERCISE CONTROL MATERIALS

LAKE CITY TABLE-TOP

Scenario

XYZ Chemicals, Inc., produces a small line of acids for sale in the manufacturing and trade markets. XYZ stores and handles a variety of chemicals on-site for use in its own processes; in addition, XYZ products are often stored on plant grounds pending shipment to customers.

XYZ's Lake City plant is located in a neighborhood characterized by a mix of industrial and residential land uses. Local industrial facilities include two large steel plants, an oil refinery and numerous specialty chemical plants. The XYZ facility itself is bounded on the north by a spur of the Union Railroad; on the south by the Grand River; on the west by Elm Street and a rail line; and on the east by First Street. Beyond the river on the south is an interstate highway that is heavily traveled. Within two miles north of the plant are seven schools and a hospital. Just north of the plant, across the Union tracks, is a residential neighborhood; additional residential zones of Lake City and Middletown lie one and one-half miles to the south and southwest, and three miles to the southeast.

Returning from their 12 p.m. break, two XYZ workers resume the task of transferring anhydrous hydrogen fluoride (AHF) from a pressurized rail car to a 15,000 gallon outdoor storage tank. They had allowed the transferring pump to operate unattended and found upon returning that the failure of an automatic shutoff valve resulted in a spill of approximately 1000 gallons. The liquid AHF has begun to pool, giving rise to vapor. Inhaling these vapors, both workers suffer severe respiratory injury. Although one worker collapses immediately, the other succeeds in activating the plant safety alarm, thereby alerting the shift supervisor that an emergency has occurred at the transfer site.

The supervisor drives to investigate the accident. Smelling the strong presence of HF vapors in the air, the supervisor stops his vehicle 200 feet from the accident site and radios the plant gate to notify the Lake City emergency response authorities by calling 911. In the process of suiting up with protective equipment, the supervisor himself collapses.

LAKE CITY TABLE-TOP

Sequence of Events and Expected Actions

EVENT 1: PLANT SUPERVISOR CALLS 911.

Message

- From: Plant employee
  To: 911

  "This is a drill. There has been a chemical spill at the XYZ plant on Elm Street."

  Note: No information is provided on identity of chemicals involved.

Expected Actions

- 911 makes necessary notifications, including[1]:
  - -- Police Department
  - -- Fire Department
  - -- Emergency Medical Services
- Other notifications made, including:
  - -- State Department of Environmental Management
  - -- State Police
  - -- Plainville Fire Department (to activate mutual aid)
  - -- Middletown Hazmat Squad
  - -- CHEMTREC/CHEMNET
  - -- National Response Center

---

[1]Underlining identifies most important response activities.

HOLD

No further events introduced until first responders arrive on scene

EVENT 2: FLOW OF CHEMICAL CONTINUING AT A RAPID RATE PLANT PERSONNEL EVACUATE. SIX WORKERS SUFFERING EYE AND RESPIRATORY IRRITATION. CONDITION OF SHIFT SUPERVISOR AND TWO WORKERS UNKNOWN. ALSO UNKNOWN WHETHER ALL OTHER PERSONNEL ARE SAFELY OUT OF PLANT.

Expected Actions

First Responders (whether Fire, Police, or Emergency Medical Services (EMS))

- Situation assessment:

  -- Confer with plant personnel to determine identity of chemical(s)

  -- Count the number of evacuated personnel

  Messages

  - From: Plant employee
    To: First responders

    "The chemical leaking from tank is Anhydrous Hydrofluoric Acid (AHF); judging from the rate of vapor formation, it is a rapid leak."

  - From: Plant employee
    To: First responders

    "Plant personnel have evacuated. Six evacuated workers have suffered injury. Shift supervisor and two employees are known missing. Not known whether all other workers have been safely evacuated."

Police Department (when they arrive)

- Close off access to plant

EMS (when they arrive)

- Establish treatment zone in a safe area
- Begin examining/treating injured workers
- Radio for backup units
- Notify City Hospital to expect injured

Fire Department (when they arrive)

- Establish command post in a safe area
- Delineate "restricted areas", staging area, decontamination zone
- Determine personnel and equipment needs
    - -- Call for additional resources, as needed
- Squad 1 personnel (and possibly Middletown Hazmat team) suit up in protective clothing to investigate leak and injured
- Squad 1 approaches accident site from upwind position
- Spokesman issues initial press statement

PAUSE

Present the next event soon after all 3 agencies have arrived

EVENT 3: WIND OBSERVED BLOWING OUT OF SOUTH/SOUTHWEST AT 5 MPH.

Message

- From: Exercise Director
  To: Fire Department Incident Commander

  "Winds blowing out of south/southwest at 5 MPH."

Expected Actions

- Begin consideration of evacuation option
- Evacuation notifications begin:
  - -- School bus company (to dispatch 3 buses)
  - -- Red Cross, Salvation Army
  - -- Lake City Civil Defense

HOLD

No further events introduced until sufficient time has passed to allow initial response actions to be well under way

EVENT 4: THREE ADDITIONAL INJURED PLANT WORKERS DISCOVERED IN PLANT POWERHOUSE.

Message

- From: Exercise Director
  To: Fire Department Incident Commander

  "Three more injured workers have called in from plant powerhouse."

Expected Actions

- Fire Department/Middletown Hazmat personnel (with protective gear) dispatched to powerhouse to evacuate additional injured
- Shift supervisor, two other initial injured employees evacuated by Squad 1 personnel to decontamination zone
- Initial injured are decontaminated (as necessary)
- Initial injured are taken to EMS treatment zone
- EMS begins triage/hospital evacuation procedures on initial injured

HOLD

No further events introduced until valve is closed by Fire Department and flow of AHF is stopped

EVENT 5: AS A RESULT OF VALVE CLOSURE, THE FLOW OF AHF HAS STOPPED; VAPOR FORMATION STOPS.

Messages

None

Expected Actions

- Fire Department crew notifies Fire Department Incident Commander that leak has been stopped
- Fire Department begins vapor suppression, pool containment procedures
- Fire Department personnel evacuate additional injured from powerhouse to decontamination zone
- Squad 1 members, additional injured decontaminated (as necessary)
- Additional injured taken to EMS treatment area
- EMS begins triage/hospital evacuation procedures

HOLD

No further events introduced until Fire Department contains AHF pool, completely suppresses AHF vapors

EVENT 6: RESPONSE COMPLETED; INCIDENT OVER.

Messages

- From: Exercise Director
  To: Fire Department Incident Commander

  "The incident is over."

Expected Actions

- All response personnel notified
- Triage/hospital evacuation completed
- Access to plant reopened
- Clean-up contractor(s) notified
- Press is briefed by press spokesman, plant spokesman

APPENDIX C

EXAMPLE TABLE-TOP EXERCISE GROUND RULES

- There will be two tables for participants at the exercise; one for "on-scene" participation and the other for EOC or command post participation. Participants will "enter" the exercise, as specific events in the script unfold, to represent those parties who would be involved in responding if the event was real. It is important that participants do not enter the exercise until they normally or reasonably would do so.

- For each event, the appropriate participants will describe fully the actions that they would take in response. Discussions as well as statements are encouraged. It is important to try and speak as loudly and clearly as possible for the benefit of those affected by the actions being described, as well as for the observers and the recorder.

- The recorder will write down the actions taken as described by each participant on the event sheet to which it pertains. These sheets will later be reviewed in the self-evaluation portion of the exercise to compare the actual responses to the anticipated responses.

- When a player's participation is no longer required at either table, the player should return to the observer section.

- The exercise facilitator may call a time-out in the exercise if technical advice or information is needed to assure the realism of the simulation.

- When anticipated responses which are critical to the purpose of the exercise are not carried out, the exercise facilitator may intervene in the play to assure that they take place.

- All questions should be directed to the exercise facilitator. Comments by observers should be made during the evaluation period and not during the exercise.

APPENDIX D

SUGGESTIONS FOR THE CONDUCT OF TABLE-TOP EXERCISES

The following are some suggestions to assist in the conduct of table-top exercises. They are subdivided into four stages -- pre-exercise, exercise, break, and evaluation.

Pre-Exercise Stage

- You should arrive in town the day before the exercise in order to make sure that all necessary arrangements have been made (meeting logistics, etc.) and to meet with your local contacts.

- The meeting room should be arranged so that there is a large table and chairs at one end and a general seating area at the other. This arrangement facilitates the use of the table as the simulated scene of the accident; exercise players come up to the table as if they were arriving at the scene of an actual emergency. You may include two tables, one for the accident scene and one for the EOC, for more complex table-tops.

- If the exercise is to be videotaped, you should plan out in advance where the camera(s) should be located and make sure that all necessary equipment is available and in good working condition.

- It is useful to have on the walls a large map of the area, clearly showing the site of the simulated accident and the key local infrastructure -- highways, schools, hospitals, etc.

- Each event in the pre-scripted sequence should be written on a separate page of a "butcher-block" paper pad. (It is on this paper, under each event, that the exercise recorder will record the response actions taken during play.)

- You should know the sequence-of-events by heart. The need may arise during the exercise to re-script as a result of unanticipated response actions. A thorough knowledge of the pre-scripted sequence will help you re-script quickly.

Exercise Stage

- You should begin the exercise itself by summarizing the objectives and scope of the table-top as formulated by the local officials.

- Next you should clearly and quickly explain the groundrules for the exercise -- i.e., the role of the facilitator and recorder, that people

  should come up to the exercise table as they become involved in the simulated response, that people are to make decisions as realistically as possible, etc.

- You should also briefly tell people that the evaluation will follow the play (i.e., that there should be no evaluation during the exercise itself). Put people at ease regarding the evaluation by stressing that they will be evaluating themselves.

- Start the actual exercise play by reading the narrative (each participant should have a copy in front of them).

- Next you should begin by displaying (on the overhead projector) the first event.

- In general, let exercise play proceed realistically, without much prompting or intervention either by facilitator/recorder team or by members of the audience.

- Some prompting may be necessary, however, either to remind people to be as realistic as possible in their actions (e.g., if certain responders in real life would confer before the incident commander makes a specific decision, they should confer during the exercise) or to keep things moving.

- As play proceeds, the facilitator should make mental or actual notes regarding the correlation between the actual response actions taken during the exercise and the "anticipated responses" identified in advance. These notes will help later during the evaluation session.

- In general, the exercise should take about 1 hour 45 minutes, followed by a 15 minute break and a 1 hour evaluation. If there is extra time available, it should go to the evaluation. It is important that the participants not feel that the exercise is "dragging"; they are busy people, don't waste their time. (The time constraint should be included in the initial "groundrules" announced at the beginning.)

- The recorder should keep an ongoing list of response actions on the butcher-block paper mentioned above.

- Stay on your toes! The need to re-script may arise at any time. If you need to call "time-out" in order to re-script or to confer before answering a procedural question, do so. But keep it brief!

Break

- During the break, the recorder and facilitator should tape each of the event/response sheets to a wall within easy eyesight. These will help as a reference point during the evaluation.

- Keep the break to 15 minutes maximum. Any longer a break risks the danger of dissipating the energy and momentum generated during the exercise.

Evaluation Stage

- For the evaluation, the key responders should be back at the table.

- The facilitator should start things off by re-explaining the purpose and process of the evaluation. The goal is to produce a list of planning issues and response problems identified during the exercise that the local officials can use in improving their plans and response systems.

- Next the recorder or facilitator should briefly (5 minutes) recapitulate the key response actions taken at each event. If you are running short on time, dispense with this and skip straight to the evaluation.

- The facilitator should then ask people to identify (in free-association style) the key issues or problems (and successes) that they observed during the exercise. Keep things moving. The recorder should register each of these either on a blackboard or on another sheet of butcher-block paper. If comments are long-winded, summarize in a few key words.

- Identify and eliminate any duplication in the concerns raised.

- Have people vote on those they believe are the 5 (more or less, use your judgment) most important. These then should each be discussed individually. The goal here is to identify very specific comments and concerns.

- If questions arise about what actually happened during play, refer people back to the event/response summary sheets taped to the wall.

- The list of concerns which comes out of this (including both the master list of issues and the more detailed comments on the "top five" issues should be written up after the exercise and provided to the local officials as, in effect, an agenda for future action.

PREPAREDNESS & PREVENTION
TECHNICAL ASSISTANCE BULLETIN #3

A Guide to Planning and Conducting Field Simulation Exercises

U.S. ENVIRONMENTAL PROTECTION AGENCY

EPA PREPAREDNESS AND PREVENTION
TECHNICAL ASSISTANCE BULLETIN #3

A GUIDE TO PLANNING AND CONDUCTING FIELD SIMULATION EXERCISES

1. INTRODUCTION

This bulletin is intended as a guide for local emergency preparedness and response personnel to use in planning, conducting, and evaluating field exercises. The Emergency Planning and Community Right-To-Know Act of 1986 requires Local Emergency Planning Committees to prepare emergency plans by October 17, 1988 and review the plans annually. The exercises described in this guide may be used in formulating, testing, and revising those plans. Planning and exercises may be used as interactive elements to maintain an effective and up-to-date emergency response system.

With this purpose in mind, this bulletin is organized as follows:

- **Section 3** describes the components of planning for a field exercise from the decision to perform a field exercise through the final pre-exercise check and set-up;
- **Section 4** provides guidelines for actually conducting the exercise;
- **Section 5** presents methods for the post-exercise debriefing and evaluation;
- **Section 6** relates the exercise experience to emergency preparedness planning; and
- The **appendices** provide a sample exercise scenario and sequence of events, example planning checklists, an exercise evaluation guide, information contacts, and reference information.

The information presented here can be supplemented by contacting the regional representatives of both EPA and FEMA (see **Appendix E**) and by referring to other published guides to emergency exercises and planning (see **Appendix F**).

2. GENERAL DESCRIPTION OF FIELD EXERCISES

Field exercises are the most complex and rigorous of the various types of emergency preparedness exercises (described in the overview of chemical emergency preparedness in Technical Assistance Bulletin #1). The procedures presented in this bulletin are based on the assumption that the community has either sufficient direct experience or expertise available to perform exercises of this complexity.

Field exercises proceed according to a chemical accident scenario and pre-determined sequence of events to simulate, as realistically as possible, a chemical emergency. Problems are presented to participants for resolution

via existing plans, standard operating procedures, emergency response systems, and/or equipment deployment protocols. As defined here, field exercises vary in complexity:

- A basic or limited field exercise involves testing single components of a community's emergency response system. Such an exercise may, for example, test only the warning and emergency public notification components. In place of a full-scale response, only certain first response agencies will be involved -- e.g., fire and emergency medical services. The exercise may involve a mix of on-scene response by a limited number of agencies and table-top simulation.

- A full-scale field exercise involves extensive site activity, as if the emergency is actually occurring. In this type of exercise, the responders may not be told in advance that an exercise is going to occur. When the notification of a hazardous chemical incident is received, the emergency response system goes into action, including all components and auxiliary services.

In order to appreciate the level of realism and complexity involved in a full-scale field exercise, the reader should refer to the appendices at the end of this bulletin. **Appendix A** provides an illustrative emergency scenario that might be used to commence an exercise. **Appendix B** provides the subsequent sequence of events that follow the beginning of the exercise and control the flow of exercise play.

3. STEPS IN DEVELOPING A FIELD EXERCISE

This section presents the various steps involved in developing a field exercise. The order in which the components are described is not necessarily the order in which they must be performed. Although some of these steps obviously must be performed before others, successful exercise planning will require interactions and overlaps among the components and should progress according to the needs of the locality. The components are presented as follows:

- Establish exercise objectives;

- Determine the basic characteristics of the exercise;

- Secure appropriate approval and commitments;

- Design and plan the exercise;

- Consider other factors such as involvement of media, or the extent of participation by public officials; and

- Provide for staging, set-up, and pre-exercise tasks.

Successful planning and execution of these components requires systematic attention. Toward this end, it is advisable to convene appropriate representatives of the agencies expected to participate in the

exercise as part of a relatively formal exercise steering committee. Regular committee meetings should be held to make necessary decisions, assign planning and logistical responsibilities, and to make sure that everything is "on track" for a successful exercise. This steering committee is also a useful mechanism for ensuring that the results of the exercise evaluation are linked back to the planning process.

Step 1: Establish Exercise Objectives

The decision to perform a field exercise will be based on various local requirements or perceived needs.[1] A jurisdiction may wish, for example, to exercise a new component of its emergency response system or a part of the emergency response system that has not been used or exercised for a long time. Testing multi-community response capabilities under a mutual aid agreement could also be an objective. The exercise may be based on existing emergency preparedness plans or be used as a tool in the development of such plans.

The reasons for performing the exercise provide the basis for the exercise objectives. These objectives should include the functions that will be exercised and the purposes of the effort (e.g., new systems, new chemical hazards, training, new or updated plan, or to gain experience). A clear statement of the general objectives of the effort should be developed. For example, a statement of objectives for the exercise for which the scenario in **Appendix A** may be used, might read as follows:

> "The exercise will test the procedures for spill notification, emergency response dispatch, containment and control measures, and evacuation."

Step 2: Determine the Basic Characteristics of the Exercise Based on Objectives

Scale of the Exercise. As described above, the field exercise can range from a limited to a full-scale, on-scene response. In determining which type of exercise you want to stage, you should consider the number of people, amount of equipment, and time-frame, as well as the level of complexity (e.g., limited field or full-scale field). Decide if the responders are to be notified beforehand or if the exercise will occur as if it is a real situation.

Functions/Systems to be Exercised. A clear statement of objectives will guide the development of the exercise. With the objectives and scale established, this component of planning should identify the emergency response system, sub-systems, or functions to be exercised. For example, the scenario in **Appendix A**, in keeping with the statement of objectives (above), could be used to test the emergency notification/ communications system; fire, rescue, and hazmat response units; and the contingency plan for evacuation.

---

[1] For assistance in making the decision to perform a field exercise refer to Exercise Design Course Guide to Emergency Management Exercises, Federal Emergency Management Agency, June 1984, SM # 170.2, pp. 17-18.

Organizations and Individuals Involved. The basic characteristics of the exercise should also include the jurisdictions, agencies, and industries (if any) involved. The organizations participating should be those referenced in emergency response systems, contingency plans, or emergency preparedness plans. (If no plans exist or organizations are identified that are not in the systems or plans, provisions should be made to follow-up the exercise by preparing or updating such systems or plans.) Industrial plants or other hazardous substance handlers may be invited to participate using their response capabilities. Each of the exercise participants should be represented in the exercise planning process, preferably by someone who in real life is involved in responding to emergencies but who will not be a "player" in the exercise. A clear distinction should be maintained between those who are responsible for planning and those who will be responding. This distinction will aid in the assignment of responsibilities and preclude any special pre-exercise preparation, on the part of the players, that would compromise the integrity of the exercise as a test of the responders' capabilities.

Type and Number of Continuous or Simultaneous Activities. The type and number of continuing or simultaneous exercise activities should be described. These activities are those basic response functions which tend to be ongoing throughout much of an emergency response, including first aid and triage, chemical spill abatement and containment, and notification and evacuation of local residents. Coordination of these activities is critical to the success of the exercise because they typically are critical in a real-life emergency. The type and number of continuous or simultaneous activities should be appropriate to fit the scale of the exercise, the functions that are to be tested, and the organizations to be tested, as previously determined in the exercise planning process.

Level of Stress. The level of stress of the exercise should also be determined. Level of stress (as described in Technical Assistance Bulletin #1) varies with the type of exercise, problems presented to the participants, and time constraints. Full-scale field exercises impose the highest degree of stress. The level of stress in the field exercise will increase as the exercise is made more true-to-life. Simultaneous activities in greater numbers and complexity will increase the level of stress. For example, a full-scale response to the spill site in a mixed residential/commercial/ industrial area, described in the **Appendix A** scenario, will impose more stress than a limited field exercise testing only, for example, a communications facility under the same scenario.

Step 3: Secure Appropriate Approval and Commitments

A statement of the objectives and basic characteristics of the exercise should be prepared for presentation to, and approval (if warranted) by, the chief executive of the jurisdiction(s) involved. This prepared statement should also be presented to the leadership of the necessary participating organizations (if they are not members of the exercise steering committee) to secure their approval and commitments to participate. Press releases; announcements to interested parties; and invitations for support, volunteers, and observers may also be developed from the statement of objectives and characteristics, once they have been officially approved. Broad assignments or directives to participating agencies and their commitments to participate and support the exercise should be made final at this time.

Step 4: Design and Plan the Exercise

Designing and planning a simulation exercise involves determining the appropriate emergency scenario and establishing the framework for preparing, managing, performing, and evaluating the exercise. Designing and planning efforts involve the following components:

- The Scenario;
- The Sequence of Events;
- Control Mechanisms;
- Participants;
- Physical Facilities;
- Simulation Equipment and Materials;
- Special Effects;
- Set-Up and Break-Down of Simulation;
- Schedule and Tasks;
- Communications; and
- Community Impacts.

Appendix C provides several checklists that may help systematize the planning process.

The Scenario. The scenario, which should be directly based on the already determined exercise objectives and basic characteristics, describes the incident that is being simulated. In effect, the scenario is the script for the accident, and should provide the following types of information:

- The hazardous materials involved including the threat they present, their form, the type of containment vessels from which they are leaking, and the quantity of leaking material;
- The nature of the accident (e.g., release, spill, fire or a combination of the three);
- The facility or transportation route where the accident occurs, including such specifics as location, setting, and building type or mode of transport;
- The characteristics of the neighborhood(s) threatened by exposure to accident effects;
- The initial number of victims, and potential victims;
- Weather conditions.

The scenario is used to create the simulated on-scene emergency which activates the emergency response system. Logistical considerations, such as scheduling, transportation, personnel assignments, and physical facilities, are central to the implementation of the scenario. The scenario should be realistic enough to meet the exercise objectives by presenting appropriate problems to the responders. The simulation, once initiated, should have the look and feel of an actual emergency, eliciting reactions from the response system without apparent interference from the exercise controllers. Problems that arise during the exercise should reflect actual weaknesses in local emergency response plans, procedures, and/or systems and not faults in the design of the exercise itself.

Refer to the scenario in **Appendix A** for its description of the hazardous materials involved, the nature of the accident, the facility, affected transportation routes, threatened neighborhoods, initial number of victims, and weather conditions.

The Sequence of Events. A sequence of events should be developed to accompany the scenario. The sequence of events proceeds step-by-step through the simulation indicating the occurrence of events, written, verbal, and simulation messages (e.g., seeing liquids spill or hearing warning devices) sent or received, and problems presented.

The sequence of events is presented to the participants, either orally or in writing, one event at a time. The events are arranged in a logical and chronological sequence designed to portray the essentials of an evolving emergency situation. The events represent changes in the circumstances of the accident or in conditions over which the participants have no control (e.g., a change in the weather or a major change in the rate of spill or leakage of the chemical).

The events in this sequence should be:

- Directly relevant to the response functions being exercised, the roles and responsibilities of the participants, the exercise objectives, and the locale of the accident;
- Tailored to the specific characteristics of an actual facility and the community in which the accident occurs; and
- Realistic, factual, and arranged in the proper sequence.

Appendix B is an example of a sequence of events that might accompany the scenario in **Appendix A.**

Control Mechanisms. Control mechanisms, which are critical in maintaining the direction and intensity of the exercise, include:

- Messages, both verbal and simulated, that provide response cues to the exercise players (examples of both types of messages have been included in **Appendix B**);
- Anticipated responses, actions or dialogue of any actors involved;

- The duration of the response from incident to completion; and

- Communications links to preserve the reality of the response, while not unduly alarming outside people or agencies (e.g., notification or requests for assistance to information services or local, state and federal agencies).

Anticipated responses can be used by the exercise simulators and evaluators as a standard against which to compare actual responses during the exercise. These standards are not shared with participants in order to ensure realistic responses. Anticipated response actions may be derived from relevant contingency plans or standard operating procedures used by one or more of the participating organizations. If plans or procedures do not exist, the anticipated response measures should be developed and documented prior to the exercise, constructed logically from the circumstances being simulated, or identified through discussions with response personnel regarding their informal operations procedures. **Appendix B** provides illustrative anticipated responses appropriate to the sample sequence of events.

Participants. All participants or players should be identified as early as possible in the exercise planning process. The number and roles of participants will vary depending on the characteristics of the exercise and available resources. (See **Appendix C.1** for a checklist of potential participants.) Roles and responsibilities should be defined for each participant and an accurate roster compiled. The roles of responders and participating agencies should be defined in contingency plans; specific response units may be pre-selected as the responders on the exercise. Roles and responsibilities may include the following:

- Exercise Coordinator. The exercise coordinator is in charge of the exercise. In that capacity, he or she is responsible for controlling the flow of events, coordinating all activities involving evaluation and taping, and determining the beginning and end of play. The exercise coordinator also explains to observers what actions are taking place and why. (See Section 3 below for a detailed discussion of the coordinator's role in conducting the exercise.)

- Simulation Control Team. The simulation control team controls responder command post communications; monitors activities in the command post, on site, and in the "hot zone" (the area contaminated due to the incident) to keep responders aware of the effects of their actions and maintain the flow and direction of the simulation; documents events on paper, camera, and video if desired; and keeps the observers or audience informed.

- Incident Commander. The incident commander is generally a senior official in the fire or police department or other local emergency response organization, often responsible for inter-agency emergency response coordination. The incident commander provides extensive assistance in planning the exercise and is in charge of all local

response personnel and coordination of responding agencies during the simulation. Although the expertise of the incident commander will be valuable throughout the planning of the exercise, the incident commander should not be directly involved in the development of the simulation scenario in order to maintain the realism of the emergency and avoid preparation for specific incident response.

- Evaluators. Evaluators observe and assess various activities during the simulation in order to report, during the formal exercise evaluation session, the strengths and weaknesses in the emergency response operations.

- Safety Officer. The safety officer checks that safety standards and plans are followed throughout the exercise, including the planning, performance, and break-down stages.

- Simulators. Simulators bring the scenario to life by handing notes to participants, controlling props (e.g., setting off smoke grenades), purposely getting in the way (e.g., "rubber-neckers"), and performing as actors (e.g., playing the role of "victims"). "Victims" in the simulation may be played by representatives of participating response agencies, other emergency response auxiliary groups, or the general public. Playing the role of a victim may be a valuable learning experience in itself, providing emergency response personnel an opportunity to experience the response from the victim's perspective.

- Observers. Observers may be selected by the planners for various substantive, political, and public relations reasons, and may include the press, local politicians, politicians or officials from neighboring jurisdictions, and officials from state and federal agencies involved in the exercise.

Physical Facilities. Arrangements must be made for pre-production work space, simulation support space, the simulation site, and post-exercise evaluation meetings. Meeting rooms and practice areas may need to be located and reserved in advance. Work plans should be reviewed to ensure that such facilities will be available when needed.

Simulation site selection should be completed early in the planning stages to provide adequate time to notify neighbors and evaluate the logistics of using the site. If a simulation site is not identified in the development of the scenario, a site that will satisfy the scenario should be selected. The layout and size of the site should be such that the scenario can be successfully performed. On-site locations for the hot zone, an area for the command post and response equipment, documentation vantage points and seating, shelter, and restrooms for observers should be identified and confirmed. The site should be thoroughly researched and prepared to accommodate the exercise, with steps taken for the displacement of normal traffic flow or parking.

Arrangements must be made for the transport of simulation equipment to and from the site, as well as for the set-up, staging, and break-down of the

accident site. Transportation for observers and victims must also be considered.

Materials and equipment to support the planning and staging of the simulation should be identified and acquired. An inventory of equipment and materials should be prepared with notes on sources, availability, and costs. Planning and staging equipment and materials may be available through participating groups or other local agencies.

Identify Simulation Equipment and Materials. An array of equipment will be needed to make the simulation realistic. Necessary equipment should be identified and purchase arrangements made as early as possible during the exercise planning process. (See **Appendix C.3** for an equipment checklist.) The participating groups may have equipment on hand that they can use or loan to other participants. Other organizations or local groups may be willing to loan or donate equipment (e.g., portable bleachers for the observers, or junked cars for the accident scene). Some equipment may need to be purchased outright; such equipment, as well as a source, should be identified early. Private industry facilities are often a good source of "loaner" equipment.

Various materials will be needed to conduct the simulation. In addition to or in lieu of special effects materials described below, victims will need such items as refreshments and background information materials (e.g., the scenario and sequence of events); documenters will need paper, cameras, or video recorders and film; and the simulation scene may need signs, props, cleanup materials, or other items to enhance the realism of the accident.

Special Effects. The exercise should be as realistic as possible. The realism of a simulation can be greatly enhanced by special effects such as props, make-up for the victims, imitation spills and vapor plumes, fire, and smoke. Special effects should be linked to the scenario to ensure appropriate timing and cue actors, victims, or responders to perform certain actions. The materials should be acquired and tested in advance; sufficient quantities must be available at the time of the simulation. Also, the special effects must be able to function under all conditions (e.g., rain).

Set-Up and Break-Down of Simulation. Provisions should be made for the orderly and timely set-up and break-down of the simulation scene. The set-up of props, such as overturned vehicles, should be completed the day before the exercise if possible. Safety of exercise participants, observers, and site neighbors, as well as site security, should be provided for as long a time as the exercise activities require personnel or equipment on the site. Set-up also includes seating, food, and restrooms for observers, narrators, documenters, and other participants, as well as roadblocks or warning tape to delineate parking/no parking areas and detours.

The exercise plan should provide for the orderly dismantling and restoration of the simulation site to provide an orderly and timely break-down. Break-down of the site should proceed as quickly as possible after the simulation to ensure the safety and convenience of site neighbors. Clearing wreckage could be included in the exercise as an element of the emergency response.

Schedule and Tasks. Field exercises are complex activities that depend on effective organization for success. Scheduling and tasking should begin

early in the planning process, as soon as possible after approval of the exercise by the necessary officials. Scheduling and tasking essentially involve the development of a work plan to assign responsibilities for specific activities, with deadline dates, to the participating groups and individuals. The schedule should include such items as meeting dates, procurement and preparation milestones, scenario development deadlines, and simulation set-up and performance dates.

Communications. Reliable communication is a necessity for responders in actual emergency response, and critical for simulators in an exercise. Telephone service, equipment, and directories should be provided where appropriate during the planning stage and particularly during the exercise itself. Communication linkages in preparedness plans should identify hardware and frequency compatibilities or incompatibilities to ensure that responders know who they can contact. A network of telephones is extremely important during the exercise to simulate and control the flow of information in a realistic fashion. The incident command post will require phones for the incident commander and other response officials, and separate lines for the simulation control team. In some cases actual lines and phone numbers may be used, in other cases the numbers of various response and support agencies may be assigned to certain simulators or locations. For example, in a limited field exercise, an exercise room with several desks equipped with phones may be set up to simulate some of the response activities.

Responders and simulation participants may be using "walkie-talkies" to communicate. The radio frequencies and compatibility among the response groups and simulators should be identified. If radio contact is not possible, alternatives should be identified and acquired.

Community Impacts. Impacts from the simulation on the community should be anticipated, monitored, and controlled. A simulation may require a number of disruptive actions including re-routing of traffic, use of public areas or facilities, and use of emergency vehicles. Parties who may be affected by the simulation -- e.g., residents and businesses at or near the simulation site --should be notified well in advance.

Step 5: Consider Other Factors

Performing an emergency response exercise is a complex undertaking; many peripherally-related, but nonetheless important considerations must be kept in mind throughout the various phases of an exercise. The type and number of these factors often depends on the community sponsoring the exercise. Although this guide does not go into detail on any of these considerations, they are mentioned here to ensure that planners are aware of them:

Safety. Safety of all participants, observers, and curious on-lookers should be considered throughout the exercise. The designated safety officer will have the responsibility of ensuring this safety, but will need the cooperation of all participants and the aid of safety plans and protocols. The more complex and realistic the exercise, the greater the likelihood of accidents.

Liability. Especially in full-scale field exercises, there is significant potential for accidents to participants, observers, and "innocent bystanders." Potential liabilities should be considered and minimized. The

signing of a liability waiver might be considered for all participants and official observers.

Cost. The cost of field exercises varies greatly with the scale and nature of the exercise itself. In many cases, however, the cost of the equipment and supplies needed to stage a field simulation will be significant. Private facilities participating in the exercise should be urged to donate time and the use of equipment. Even where such donations are made, field exercises require a great deal of coordination and pre-planning and, therefore, consume scarce public agency staff time. Before undertaking an exercise, the planning committee should carefully identify and estimate all likely expenses and evaluate all available means of reducing those expenses.

Step 6: Provide for Staging and Set-Up, Pre-Exercise Check, and Briefing for Participants

After weeks or months of planning and coordinating, performance of the exercise should not be jeopardized by last-minute problems. Staging and set-up of the exercise should be done a day in advance if possible. This will provide for last-minute problems with the site or equipment and, time and resources permitting, a shake-down or trial-run of all props and special effects. Omissions or oversights may be caught at this time and corrected. Immediately before the exercise, the pre-exercise check should be performed as a last-minute run through of checklists and logistics. The pre-exercise briefing may be used to inform participants of last-minute changes or problems that may require alternative actions and resolve any uncertainties the participants may have.

4. GUIDELINES FOR CONDUCTING THE EXERCISE

The major exercise development steps, discussed above, set the stage for the smooth conduct of the exercise by the exercise coordinator. On the day of the event, the exercise coordinator must assume direct responsibility for the conduct of the exercise to ensure adequate accomplishment of its objectives. The exercise coordinator's job is to:

- Describe the "ground-rules" for the exercise, including the roles that the various participants are to play;
- Present the players with the exercise narrative;
- Announce the first event of the scenario;
- Stimulate player responses, without intervening in a way that assumes control of the play, unless it appears likely that the players will not initiate a response critical to the objectives of the exercise;
- Control the flow and pace of the exercise by introducing the remaining events in sequence; and
- Keep the exercise on schedule and terminate play at the specified end time.

In general, it is best to let the exercise play develop naturally, with participants responding to prescribed events as they deem appropriate. Some anticipated responses, however, may be so critical to the completion of the simulation that the exercise coordinator will have to intervene in the play to assure that such responses take place. (The fact that intervention is required will, of course, represent a very important lesson for the exercise participants and should be noted for further discussion in the post-exercise debriefing and evaluation.) An example, based on the scenario in **Appendix A**, would be the activation of the evacuation process (one of the objectives on which the scenario would have been based). If the participants in an exercise using the **Appendix A** scenario did not respond to messages or cues with activation of the evacuation process, the exercise coordinator would intervene.

5. GUIDELINES FOR CONDUCTING A POST-EXERCISE DEBRIEFING AND EVALUATION

A post-exercise debriefing and evaluation can be as valuable an experience as the exercises. These post-exercise sessions are critical for capturing the lessons of the field exercise so that they can be used to revise and improve emergency plans and procedures. The exercise coordinator should first conduct a debriefing session, in which the primary objective is to review the experiences of the participants during the exercise. A debriefing works best if the exercise coordinator leads the participants through an event-by-event recapitulation of the exercise, discussing the actual responses and how they compared to the anticipated responses. The debriefing may cover all events and responses before they are evaluated, or it may proceed one event at a time, allowing an opportunity for evaluation as well.

Once the debriefing is completed, the exercise coordinator should elicit evaluations from the participants concerning both their own performance during the exercise and the characteristics of the exercise as a whole. This process will be enhanced if the participants understand that the purpose of the evaluation is to develop a set of recommendations for improving the response system, rather than to find fault with the performance of the participants. These recommendations may include actions to improve emergency response plans, procedures, and equipment as well as additional training needs for members of the response system. **Appendix D** provides criteria that may be useful in conducting the debriefing or exercise evaluation.

It is important that problems in the response system (e.g., lack of plans or procedures) be separated from problems related to the specific exercise design or conduct (e.g., a scenario event that did not match conditions in the community or a special effect that failed). Thus, the exercise coordinator should allow opportunity for the participants to evaluate the exercise itself. The exercise coordinator should be alert to both the possibility that the participants may be more critical of the exercise than of their own performance and the fact that problems with exercise design and conduct may have produced some responses that do not reflect existing plans, procedures, or response capabilities of the participants.

Following the debriefing and self-evaluations by the participants, the exercise coordinator or exercise sponsors may want to open up discussions

with community groups, local industries, and the press. A mock or actual press conference may be called. An open forum to discuss the exercise may aid in community relations and cooperation by allowing citizens and representatives of perhaps controversial local industries to comment on the exercise and emergency response system. This type of evaluation, conducted some time after the exercise, may prove to be a useful complement to the immediate debriefing session. Intervening time and the participation of a broader cast of evaluators may provide fresh or at least additional perspectives.

6. USING EXERCISES TO IMPROVE EMERGENCY PREPAREDNESS, PLANNING, AND RESPONSE

The results of the debriefing/evaluation period, in the form of improvements in the response system, need to be implemented if the exercise is to be of maximum benefit. These results should be included in the continuing planning and preparedness activities of the community. Local planners should initiate efforts to revise existing plans and procedures or develop new ones to reflect the lessons from the exercise (e.g., revise notification procedures, clarify responsibilities for providing services to an evacuated population). Exercise planners should use the evaluation of the exercise itself to improve future exercises. All other parties (e.g., police, fire, emergency, medical) should take actions appropriate to their roles in the preparedness effort. Approximately three to six months following the exercise, the contingency plans and procedures should be reviewed to ensure that appropriate changes and revisions have been incorporated.

LIST OF APPENDICES

Appendix	Title
A	Sample Field Exercise Scenario
B	Sample Sequence of Events
C	Sample Planning Checklists
D	Criteria for Assessing State and Local Preparedness
E	Regional Federal Agency Contacts
F	References to Additional Information

APPENDIX A

Sample Field Exercise Scenario

The PQX Chemical Co. plant, located on Lee Highway, manufactures a variety of corrosive, toxic, and flammable chemicals. Many of these chemicals are stored at the plant pending shipment to customers. The plant occupies 50 acres of land and is situated in an area composed of commercial, industrial, and residential buildings. The plant property is bounded on the north by Lee Highway, on the east by a rail line, on the south by Interstate 20 and on the west by the Black River. Beyond the river to the west, is the Black River Estates housing development. South of Interstate 20 is the Clover Hill housing development. On the north side of Lee Highway lies a mixture of commercial and industrial buildings. East of the railroad line, there are a variety of industrial facilities. A railroad siding extends into the plant property to the outside storage area.

One clear Saturday morning, a day when the plant is not operating, a repair crew is working on replacing a section of pipe that is connected to the top of an empty tank. After disconnection, a crane is used to lower the pipe onto a flat bed truck. As the crane boom is swung over a nearby tank of liquid sulfur trioxide, the cable snaps, thus, dropping the pipe. The falling pipe shears off the SO_3 tank's feedline between the tank wall and the first block valve. The four-inch diameter feedline leading from the tank to the process plant begins leaking immediately. An excess flow valve between the leak and the tank limits the rate of flow to 30 gallons per minute.

Spilled liquid from the SO_3 tank collects within the containment dike surrounding the tanks. Upon contact with the moisture in the air, the spilled SO_3 vaporizes into a white mist resembling steam. The wind, coming from the northwest at 5 mph, blows the vapors directly onto the nearby repair crew that had removed the old piping. Three of the four repairmen are affected by the vapors, with two of them lying unconscious on top of the tank they had been working on. The lone conscious repairman drags the remaining workers from the hazardous area and then runs into the main plant to report the accident. Experiencing burning eyes and difficult breathing, he decides to remain indoors awaiting the arrival of the fire department.

APPENDIX B

Sample Sequence of Events

EVENT #1: The northeasterly wind blows the vapor cloud coming off the spilled SO_3 towards the southwest across plant property. Arriving fire/rescue personnel find an unconscious person just beyond the diked area.

Simulation Message: Simulators will set off a white smoke grenade or other smoke/cloud generation device to simulate the SO_3 vapor cloud. Large portable fans may have to be employed to direct the vapors in the desired direction dictated by the exercise. An exercise "victim" should be lying outside of the diked area but away from the white smoke/cloud. Water from a hoseline attached to the feedline of the SO_3 tank will be flowing at a rate of 30 gpm into the diked area to simulate the leaking SO_3.

Written/Verbal Messages: None.

Expected Actions:

1. First arriving fire/rescue units report the on-scene situation to the emergency communications center and request additional fire/rescue and police units (if necessary).

2. Rescue unconscious person near diked area and provide emergency medical treatment following rescue.

3. Incident commander takes command and establishes:

   - Command post (in safe location)
   - Communications among response agencies at scene
   - Staging area for in-coming apparatus
   - Mechanism for on-going incident assessment

4. Ensure that emergency personnel wear appropriate protective gear.

5. Secure area around the incident scene.

6. Attempt to locate a plant official who can identify the leaking material and provide technical expertise concerning the tank, feedline, control valves, dike, etc.

EVENT #2: The injured repairman that reported the accident advises fire/rescue personnel of the two unconscious workers on top of the tank next to the leaking tank. The repairman tells how the accident occurred and warns of the hazards of the vapors emanating from the spilled liquid.

Simulation Message: Simulators will continue to generate a white cloud to simulate the vaporizing SO_3. The simulated leak will also be continued. The repairman "victim" will be acting as if he is having trouble breathing and a burning sensation in his eyes.

Verbal Message:

To: Fire/Rescue Personnel

From: Injured Repairman

Message: Joe and Charlie are still up on the tank. I think they've passed out. Do you see them? They were still up there when the pipe fell from the cable and hit the other tank. I don't know what that leaking stuff is, but watch it, it's nasty.

Expected Actions:

1. Plan strategy for the rescue of the two unconscious workers on top of the tank.

2. Provide emergency medical treatment for the repairman experiencing difficult breathing and burning eyes.

3. Contact CHEMTREC and/or other technical assistance organization for assistance in identifying the leaking chemical.

4. Activate the off-site emergency operations center (EOC) and notify key officials and agencies of the local government.

5. Continue efforts to locate a plant official.

6. Continue efforts to identify the leaking material.

7. Identify strategies and options for controlling the leak.

8. Arrange for specialized equipment to be brought to the scene:

   - Encapsulated suits
   - Self-contained breathing apparatus
   - Environmental monitors
   - Patching/plugging materials
   - Foam
   - Diking materials
   - Emergency medical supplies

9. Notify the following:

- Community Emergency Coordinator
- National Response Center
- State Environmental Protection Agency

EVENT #3: The vapor cloud is approaching Interstate 20.

Simulation Message: Simulators will continue to generate the white cloud but not in amounts great enough to transport the cloud to the interstate, thus avoiding obstructing the view of passing motorists not involved in the exercise. The purpose of the cloud is for realism at the actual storage tank area.

Verbal Message: (via two-way radio)

To: On-Scene Incident Commander

From: Emergency Communications Center

Message: Motorists on Interstate 20 are reporting "white smoke" just north of the interstate. Could that be coming from your location?

Expected Actions:

1. Initiate monitoring of vapor cloud and spill.

2. Confirm vapor cloud movement.

3. Close Interstate 20 downwind of the vapor cloud.

4. Consider protective actions for residents south of Interstate 20.

5. Request mutual aid (if necessary):

   - Fire/rescue
   - Hazardous materials team
   - Emergency medical services
   - Law enforcement

6. For arriving mutual aid units:

   - Brief them about incident
   - Assign tasks to them
   - Ensure they wear appropriate protective gear
   - Establish inter-organizational communications

7. Establish communications between the on-scene command post and the EOC, and coordinate all response actions.

8. Expand efforts to secure the area around the incident scene:

   - Roadblocks
   - Rerouting of traffic
   - Spectator control

9. Establish a media center and appoint a public information officer.

EVENT #4: Fire/rescue personnel have located the two unconscious workmen on top of the tank next to the leaking tank.

Simulation Message: Simulators will continue to generate the white cloud and allow the 30 gpm flow of water into the diked area to continue. The two "victims" on top of the tank should lie still to simulate unconsciousness.

Written/Verbal Messages: None.

Expected Actions:

1. Rescue the two unconscious workers if it is decided that adequate protective gear is available at the scene for rescuers.

2. Provide emergency medical treatment for the two unconscious workers following their rescue.

3. Establish an on-scene triage area for injured workers and emergency response personnel.

EVENT #5: The vapor cloud has moved as far as Interstate 20 and is fast approaching the Clover Hill housing development. A plant official arrives on the scene and advises the incident commander that the leaking product is liquid sulfur trioxide and that the 70-ton capacity tank was approximately 80 percent full prior to the accident.

Simulation Message: Simulators will continue to generate the white cloud in the area near the tanks and continue the flow of water into the diked area.

Verbal Messages:

To: On-Scene Incident Commander

From: Emergency Communications Center

Message: Motorists are now reporting a white mist coming across the interstate from the northwest. They advise that it's irritating to their eyes and throats.

To: On-Scene Police Department Commander

From: Patrol Unit

Message: The vapors from your location have reached Interstate 20 and are heading towards Clover Hill. Please advise.

To: On-Scene Incident Commander

From: PQX Chemical Company Official

Message: The leaking product is sulfur trioxide. As of close of business yesterday, it contained approximately 55 tons of SO_3.

Expected Actions:

1. Evacuate Clover Hill and other nearby residences.

2. Open emergency shelters for evacuees.

3. Disseminate information to all emergency response personnel and agencies involved in the incident that the leaking material has been identified as liquid sulfur trioxide.

4. Contact CHEMTREC and/or other technical assistance organizations for:

   - Chemical specific information
   - Associated health hazards
   - Recommended control/cleanup actions

5. Ensure that protective gear is compatible with SO_3 is worn by all emergency personnel operating in the vicinity of the leaking tank and vapor cloud.

6. Continue monitoring the vapor cloud for movement and concentration.

7. Identify strategies and options for reducing the quantity of vapors emanating from the spilled SO_3.

8. Continue efforts to identify strategies and options for controlling the leak.

9. Coordinate response efforts between the on-scene incident commander, plant officials, and the EOC.

10. Provide public information concerning:

    - Hazards
    - Evacuation
    - Safety/precautions
    - Details of remedial actions

EVENT #6: Despite vaporization, the diked area is filling up rapidly with spilled liquid.

Simulation Message: Simulators will continue to allow the water to flow from the hoseline into the diked area at a rate of 30 gallons per minute. The white cloud will also continue to be generated to simulate vaporization of product.

Written Message: (via messenger)

To: On-Scene Incident Commander

From: Simulator

Message: The diked area contains a considerable amount of SO_3 and continues to fill at a rapid rate.

Expected Actions:

1. Arrange for the off-loading of the SO_3 from the damaged tank to other large capacity tanks that are compatible with SO_3.

2. Identify strategies and options for removing the SO_3 contained within the dikes.

EVENT #7: Winds begin to shift from the northeast to the southeast. The National Weather Service's forecast calls for temperatures and humidity to increase as winds shift.

Simulation Message: Simulators will employ the use of large fans (if necessary) to simulate a wind shift so that the white cloud will blow towards the west instead of the southwest. The simulated SO_3 spill will be continued at 30 gpm.

Written Messages: (via messenger)

To: On-Scene Incident Commander

From: National Weather Service

Message: Be advised that winds will be shifting over the next 10-12 hours to the southeast at 3 mph. Temperatures will rise 5-7 degrees, and humidity will increase as well.

Verbal Messages: (via two-way radio)

To: On-Scene Police Department Commander

From: Patrol Unit

Message: I'm at the roadblock along westbound Interstate 20. It looks as though the vapor cloud is heading more towards the west now, in the direction of Black River Estates.

To: On-Scene Incident Commander

From: Emergency Communications Center

Message: Citizens are reporting irritating vapors in the Black River Estates area. We've received several calls on this.

Expected Actions:

1. Disseminate information to all emergency response personnel and agencies involved in the incident concerning the wind shift and weather forecast.

2. Evacuate the Black River Estates housing development.

3. Open additional emergency shelters for evacuees.

4. Expand efforts to secure the area to the west of the plant:

   - Set up roadblocks
   - Reroute traffic
   - Control spectators

5. Consider evacuating the commercial/industrial area northwest of the plant.

6. Continue monitoring the vapor cloud for movement and concentration.

EVENT #8: An unconscious person has been spotted in a canoe floating down the Black River just west of the plant. In addition, numerous residents west of the plant have been injured.

Simulation Message: Simulators will continue their efforts to direct a white cloud towards the west. They will also continue to allow water to flow at 30 gpm into the diked area. One "victim" will lie in a slumped position in a canoe in a calm spot on the river. Several "victims" in the Black River Estates will act as though they are experiencing difficult breathing and burning eyes.

Verbal Messages: (via two-way radio)

To: Emergency Medical Services Commander

From: Emergency Communications Center

Message: We've received a report of an unconscious person in a canoe on the Black River between the PQX plant and Interstate 20. The caller saw the canoe floating from the area affected by the vapor cloud.

To: Emergency Medical Services Commander

From: Emergency Communications Center

Message: Police report finding numerous persons in the process of evacuating Black River Estates who have requested emergency medical treatment for irritated eyes and noses.

Expected Actions:

1. Provide emergency medical treatment for numerous injured persons.
2. Prepare the local hospital for numerous chemical-related casualties and make arrangements for transporting patients to other hospitals, if necessary.
3. Rescue the unconscious canoeist.
4. Evacuate the commercial/industrial area northwest of the plant.
5. Expand efforts to secure the area to the northwest of the plant:
   - Set up roadblocks
   - Reroute traffic
   - Control spectators
6. Continue monitoring vapor cloud for movement and concentration.

7. Apply acid-based foam (if available) to the surface of the contained SO_3 to prevent the release of hazardous vapors.

EVENT #9: Two railroad tankcars have been brought onto the siding next to the SO_3 tank. Off-loading operations of the tank will be difficult due to the presence of spilled liquid around the tank within the diked area.

Simulation Message: Simulators will continue to allow water to flow into the diked area and will continue to generate a white cloud and direct it towards the west.

Verbal Messages:

To: Plant Official

From: Railroad Engineer

Message: How should I position the two empty tankcars for off-loading operations?

To: On-Scene Incident Commander

From: Senior Fire Department Officer

Message: We're going to have a difficult time gaining access to the unloading outlet on the tank with all this liquid SO_3 around the base of the tank. It would be unsafe to have anyone walk through the liquid, even if they're wearing Level A protective gear.

Expected Actions:

1. Identify strategies and options for gaining access to the unloading outle . on the SO_3 tank without endangering the lives of the personnel assigned the task.

2. Off-load the SO_3 from the tank to the railroad tank cars.

3. Continue monitoring the vapor cloud for movement and concentration.

EVENT #10: The product has been completely off-loaded from the tank to the railcars, thus, ending the leak. Vapors, however, continue to be given off from the spilled liquid within the dikes.

Simulation Message: Simulators will continue to generate a white cloud and direct it towards the west until actions are taken to prevent the vaporization of product and/or pump the product to tanks.

Verbal Messages:

To: On-Scene Incident Commander

From: Senior Fire Department Officer

Message: We just finished off-loading the SO_3 to the tankcars. The leak has stopped.

To: On-Scene Incident Commander

From: Senior Fire Department Officer

Message: The contained liquid is still vaporizing.

Expected Actions:

1. Disseminate information to all emergency responders and agencies involved in the incident that the leak has been stopped but that hazardous vapors continue to be generated from the spilled material.

2. Continue monitoring the vapor cloud for movement and concentration.

3. Apply acid-based foam (if available) to the surface of the contained SO_3 to prevent the release of hazardous vapors (if not already done).

4. Pump liquid SO_3 from the containment dikes into rail tank cars or other compatible tanks.

5. Consider post-incident operations, following the complete elimination of hazards, including:

   - Cleanup
   - Decontamination of personnel, equipment, apparatus, and property
   - Removal and disposal of hazardous wastes
   - Re-entry of evacuees to residential areas
   - Opening of roads and the evacuated commercial/industrial area
   - Continued air monitoring

APPENDIX C

Sample Planning Checklists

Appendix	Title
C.1	List of Possible Simulation Exercise Participants
C.2	Planning Checklist
C.3	Equipment Checklist

APPENDIX C.1[2]

List of Possible Simulation Exercise Participants

Fire Departments

Local

Industrial

Medical

Ambulance

Rescue squads

Toxicologists

Doctors

Poison control center

Hospital

Red Cross

Police Departments

Local

County

State

Highway patrol

Sheriff

Industrial security

---

[2] This list adapted from "The Day Before...," a simulation exercise planning guide developed by the EPA Region VII Technical Assistance Team (see **Appendix F**).

Civil Defense/Disaster Services

Local

State

Federal Emergency Management Agency (FEMA)

Health Departments

Local

State

Federal Centers for Disease Control (CDC)

Public Works/Utilities

Water

Sewage treatment

Electric/gas

Environmental Scientists

Local

State

Private

Universities

Local Emergency Response Contractors

Mitigation

Removal

Heavy equipment

Federal Agencies

U.S. Coast Guard

National Oceanic and Atmospheric Administration

Department of Transportation

Army Corps of Engineers

National Guard

Environmental Protection Agency

Geologic Survey

Fish and Wildlife Service

Local Hazardous Materials Carriers

Truck

Rail

Barge

Chemical Experts

Industry

University

CHEMTREC

Meteorologists

National Weather Service

Television

Airport

Communications

Radio

Television

APPENDIX C.2[3]

Planning Checklist

Key Threshold Actions

- Has the site of the simulated incident been identified?
- Is there a local contingency plan or standard operating procedures in effect?
- Have planning issues or response needs been identified? If so, what are they?
- What type of simulation do you want to undertake?
- Who will participate in the exercise?
- How will the exercise be documented?
- Has the scenario description been developed?
- Have the sequence of events and control materials been written?
- What equipment is required for the exercise? (See separate list in **Appendix C.3.**)

Pre-Production Planning and Logistics

- Has the date been set for the exercise?
- Have the participants been notified?
- Has the site of the exercise been identified and arranged for?
- Is there an area for observers?
- Is there an area for the narrator?
- Where will video equipment be located?
- Where will the press be located?
- Have special effects been arranged for?

---

[3] This list adapted from "The Day Before...", a simulation exercise planning guide developed by the EPA Region VII Technical Assistance Team (see **Appendix F**).

- Is there someone designated to manage special effects?
- Have all essential equipment, supplies, and props been acquired?

Simulation Staging

- Are all members of the Exercise Steering Committee prepared?
- Have site arrangements been confirmed?
- Have invitations to and arrangements for observers been confirmed?
- Has the press been notified?
- Has video documentation been arranged?
- Are all equipment, supplies, and props in ready condition?
- Have all necessary manifests or bills of lading been prepared?
- Has set-up and staging help been arranged for?
- Has prop placement and set-up plan been completed?

Follow-up Review and Evaluation

- Has a meeting room been arranged?
- Have necessary audio-visual aids been arranged?
- Has a review and evaluation procedure been determined?

APPENDIX C.3[4]

Field Simulation Equipment List

Props

Drums

Tanks

Boxes

Vehicles

Moulage

Water

Simulated hazardous materials

Smoke

Pyrotechnic supplies

Other

Firefighting/Suppression

Trucks/apparatus

Tools/equipment

Foam and equipment

Fire extinguishers

Other

---

[4] This list adapted from "The Day Before...", a simulation exercise planning guide developed by the EPA Region VII Technical Assistance Team (see Appendix F).

Rescue and First Aid

- Vehicles
- Stretchers
- First aid/trauma kits
- Oxygen
- Other

Containment Devices

- Booms
- Patches, plugs
- Sand bags
- Pneumatic bags
- Plastic sheets/tarps
- Neutralizers
- Sorbents
- Shovels
- Other

Personal Protective Equipment

- Respirators
  - Pressure demand SCBA
  - Air-purifying respirators
- Chemical protective clothing
  - Splash suits
  - Fully-encapsulating suits
  - Gloves
  - Boots
  - Disposables

Hardhats

Eye protection

Face shields

Duct tape

Other

Monitoring Instruments

Combustible gas indicators

Oxygen meters

Detector tubes

Organic survey meters

Radiation survey meters

Passive dosimeters

Specific survey instruments

Litmus paper, pH paper

Other

Sampling Equipment

Sampling devices

Containers

Labels

Packaging

Other

Communications Equipment

Radios/"walkie-talkies"

Telephones

Megaphones

Horns

Other

Contamination Reduction Equipment

Buckets, tubs, containers

Plastic

Brushes

Water

Detergent

Sprayers

Other

References

EPA Extremely Hazardous Chemicals Profiles

Department of Transportation Emergency Response Guidebook

Documentation Equipment

Video cameras

Still cameras

Tape recorders

Note pads

Other

Heavy Equipment

Backhoes

Dump trucks

Vacuum trucks

Offload tankers

Cranes

Bulldozers

Other

Miscellaneous

Meteorological equipment

Clipboards

Binoculars

Salvage drums

Barriers for site control

Tools

Other

APPENDIX D[5]

Criteria for Assessing State and Local Preparedness

C.1 INTRODUCTION

The criteria in this appendix, an adaptation of criteria developed by the Preparedness Committee of the NRT in August 1985, represent a basis for assessing a State or local hazardous materials emergency response preparedness program. These criteria reflect the basic elements judged to be important for a successful emergency preparedness program.

The criteria are separated into six categories, all of which are closely interrelated. These categories are hazards analysis, authority, organizational structure, communications, resources, and emergency planning.

These criteria may be used for assessing the emergency plan as well as the emergency preparedness program in general. **It must be recognized, however, that few State or local governments will have the need and/or capability to address all these issues and meet all these criteria to the fullest extent.** Resource limitations and the results of the hazards analysis will strongly influence the necessary degree of planning and preparedness. Those governmental units that do not have adequate resources are encouraged to seek assistance and take advantage of all resources that are available.

Other criteria exist that could be used for assessing a community's preparedness and emergency planning. These include FEMA's CPG 1-35 (Hazard Identification, Capability Assessment and Multi-Year Development Plan for Local Governments) and CPG 1-8A. Additionally, States may have issued criteria for assessing capability.

C.2 THE CRITERIA

C.2.1 Hazards Analysis

"Hazards Analysis" includes the procedures for determining the susceptibility or vulnerability of a geographical area to a hazardous materials release, for identifying potential sources of a hazardous materials release from fixed facilities that manufacture, process, or otherwise use, store, or dispose of materials that are generally considered hazardous in an unprotected environment. This also includes an analysis of the potential or probable hazard of transporting hazardous materials through a particular area.

A hazards analysis is generally considered to consist of identification of potential hazards, determination of the vulnerability of an area as a result of the existing hazards, and an assessment of the risk of a hazardous materials release or spill.

The following criteria may assist in assessing a hazards analysis:

- ☐ Has a hazards analysis been completed for the area? If one exists, when was it last updated?
- ☐ Does the hazards analysis include the location, quantity, and types of hazardous materials that are manufactured, processed, used, disposed, or stored within the appropriate area?

---

[5] These criteria have been reprinted from the Hazardous Materials Emergency Planning Guide (NRT-1), prepared by the National Response Team.

- ☐ Was it done in accordance with community right-to-know laws and prefire plans?
- ☐ Does it include the routes by which the hazardous materials are transported?
- ☐ Have areas of public health concern been identified?
- ☐ Have sensitive environmental areas been identified?
- ☐ Have historical data on spill incidents been collected and evaluated?
- ☐ Have the levels of vulnerability and probable locations of hazardous materials incidents been identified?
- ☐ Are environmentally sensitive areas and population centers considered in analyzing the hazards of the transportation routes and fixed facilities?

C.2.2 Authority

"Authority" refers to those statutory authorities or other legal authorities vested in any personnel, organizations, agencies, or other entities in responding to or being prepared for responding to hazardous materials emergencies resulting from releases or spills.

The following criteria may be used to assess the existing legal authorities for response actions:

- ☐ Do clear legal authorities exist to establish a comprehensive hazardous materials response mechanism (Federal, State, county, and local laws, ordinances, and policies)?
- ☐ Do these authorities delegate command and control responsibilities between the different organizations within the same level of government (horizontal), and/or provide coordination procedures to be followed?
- ☐ Do they specify what agency(ies) has (have) overall responsibility for directing or coordinating a hazardous materials response?
- ☐ Do they specify what agency(ies) has (have) responsibility for providing assistance or support for hazardous materials response and what comprises that assistance or support?
- ☐ Have the agency(ies) with authority to order evacuation of the community been identified?
- ☐ Have any limitations in the legal authorities been identified?

C.2.3 Organizational Structure

"Organization" refers to the organizational structure in place for responding to emergencies. This structure will, of course, vary considerably from State to State and from locality to locality.

There are two basic types of organizations involved in emergency response operations. The first is involved in the planning and policy decision process similar to the NRT and RRT. The second is the operational response group that functions within the precepts set forth in the State or local plan. Realizing that situations vary from State to State and

locality to locality and that emergency planning for the State and local level may involve the preparation of multiple situation plans or development of a single comprehensive plan, the criteria should be broadly based and designed to detect a potential flaw that would then precipitate a more detailed review.

- ☐ Are the following organizations included in the overall hazardous materials emergency preparedness activities?
  - Health organizations (including mental health organizations)
  - Public safety
    - fire
    - police
    - health and safety (including occupational safety and health)
    - other responders
  - Transportation
  - Emergency management/response planning
  - Environmental organizations
  - Natural resources agencies (including trustee agencies)
  - Environmental agencies with responsibilities for:
    - fire
    - health
    - water quality
    - air quality
    - consumer safety
  - Education system (in general)
    - public education
    - public information
  - Private sector interface
    - trade organizations
    - industry officials
  - Labor organizations
- ☐ Have each organization's authorities, responsibilities, and capabilities been determined for pre-response (planning and prevention), response (implementing the plan during an incident), and post-response (cleanup and restoration) activities?

- ☐ Has one organization been given the command and control responsibility for these three phases of emergency response?
- ☐ Has a "chain of command" been established for response control through all levels of operation?
- ☐ Are the roles, relationships, and coordination procedures between government and non-government (private entities) delineated? Are they understood by all affected parties? How are they instituted (written, verbal)?
- ☐ Are clear interrelationships, and coordination procedures between government and non-government (private entities) delineated? Are they understood by all affected parties? How are they instituted (written, verbal)?
- ☐ Are the agencies or departments that provide technical guidance during a response the same agencies or departments that provide technical guidance in non-emergency situations? In other words, does the organizational structure vary with the type of situation to be addressed?
- ☐ Does the organizational structure provide a mechanism to meet regularly for planning and coordination?
- ☐ Does the organizational structure provide a mechanism to regularly exercise the response organization?
- ☐ Has a simulation exercise been conducted within the last year to test the organizational structure?
- ☐ Does the organizational structure provide a mechanism to review the activities conducted during a response or exercise to correct shortfalls?
- ☐ Have any limitations within the organizational structure been identified?
- ☐ Is the organizational structure compatible with the Federal response organization in the NCP?
- ☐ Have trained and equipped incident commanders been identified?
- ☐ Has the authority for site decisions been vested in the incident commanders?
- ☐ Have the funding sources for a response been identified?
- ☐ How quickly can the response system be activated?

C.2.4 Communication

"Communication" means any form or forms of exchanging information or ideas for emergency response with other entities, either internal or external to the existing organizational structure.

Coordination:

- ☐ Have procedures been established for coordination of information during a response?
- ☐ Has one organization been designated to coordinate communications activities?

- ☐ Have radio frequencies been established to facilitate coordination between different organizations?

Information Exchange:

- ☐ Does a formal system exist for information sharing among agencies, organizations, and the private sector?
- ☐ Has a system been established to ensure that "lessons learned" are passed to the applicable organizations?

Information Dissemination:

- ☐ Has a system been identified to carry out public information/community relations activities?
- ☐ Has one organization or individual been designated to coordinate with or speak to the media concerning the release?
- ☐ Is there a communication link with an Emergency Broadcast System (EBS) point of entry (CPCS-1) station?
- ☐ Does a communications system/method exist to disseminate information to responders, affected public, etc.?
- ☐ Is this system available 24-hours per day?
- ☐ Have alternate systems/methods of communications been identified for use if the primary method fails?
- ☐ Does a mechanism exist to keep telephone rosters up-to-date?
- ☐ Are communications networks tested on a regular basis?

Information Sources and Database Sharing:

- ☐ Is a system available to provide responders with rapid information on the hazards of chemicals involved in an incident?
- ☐ Is this information available on a 24-hour basis? Is it available in computer software?
- ☐ Is a system in place to update the available information sources?

Notification Procedures:

- ☐ Have specific procedures for notification of a hazardous materials incident been developed?
- ☐ Are multiple notifications required by overlapping requirements (e.g., State, county, local each have specific notification requirements)?
- ☐ Does the initial notification system have a standardized list of information that is collected for each incident?
- ☐ Does a network exist for notifying and activating necessary response personnel?

- ☐ Does a network exist for notifying or warning the public of potential hazards resulting from a release? Does this network have provisions for informing the public what hazards to expect, what precautions to take, whether evacuation is required, etc.?

- ☐ Has a central location or phone number been established for initial notification of an incident?

- ☐ Is the central location or phone number accessible on a 24-hour basis?

- ☐ Does the central location phone system have the ability to expand to a multiple line system during an emergency?

Clearinghouse Functions:

- ☐ Has a central clearinghouse for hazardous materials information been established with access by the public and private sector?

C.2.5 Resources

"Resource" means the personnel, training, equipment, facilities, and other sources available for use in responding to hazardous materials emergencies. To the extent that the hazards analysis has identified the appropriate level of preparedness for the area, these criteria may be used in evaluating available resources of the jurisdiction undergoing review.

Personnel:

- ☐ Have the numbers of trained personnel available for hazardous materials been determined?

- ☐ Has the location of trained personnel available for hazardous materials been determined? Are these personnel located in areas identified in the hazards analysis as:

  - heavily populated;
  - high hazard areas – i.e., numbers of chemical (or other hazardous materials) production facilities in well-defined areas;
  - hazardous materials storage, disposal, and/or treatment facilities; and
  - transit routes?

- ☐ Are sufficient personnel available to maintain a given level of response capability identified as being required for the area?

- ☐ Has the availability of special technical expertise (chemists, industrial hygienists, toxicologists, occupational health physicians, etc.) necessary for response been identified?

- ☐ Have limitations on the use of above personnel resources been identified?

- ☐ Do mutual aid agreements exist to facilitate interagency support between organizations?

Training:

- ☐ Have the training needs for the State/local area been identified?
- ☐ Are centralized response training facilities available?
- ☐ Are specialized courses available covering topics such as:
  - organizational structures for response actions (i.e., authorities and coordination);
  - response actions;
  - equipment selection, use, and maintenance; and
  - safety and first aid?
- ☐ Does the organizational structure provide training and cross training for or between organizations in the response mechanism?
- ☐ Does an organized training program for all involved response personnel exist? Has one agency been designated to coordinate this training?
- ☐ Have training standards or criteria been established for a given level of response capability? Is any certification provided upon completion of the training?
- ☐ Has the level of training available been matched to the responsibilities or capabilities of the personnel being trained?
- ☐ Does a system exist for evaluating the effectiveness of training?
- ☐ Does the training program provide for "refresher courses" or some other method to ensure that personnel remain up-to-date in their level of expertise?
- ☐ Have resources and organizations available to provide training been identified?
- ☐ Have standardized curricula been established to facilitate consistent Statewide training?

Equipment:

- ☐ Have response equipment requirements been identified for a given level of response capability?
- ☐ Are the following types of equipment available?
  - personal protective equipment
  - first aid and other medical emergency equipment
  - emergency vehicles available for hazardous materials response
  - sampling equipment (air, water, soil, etc.) and other monitoring devices (e.g., explosivity meters, oxygen meters)
  - analytical equipment or facilities available for sample analyses

- fire-fighting equipment/other equipment and material (bulldozers, boats, helicopters, vacuum trucks, tank trucks, chemical retardants, foam)

- ☐ Are sufficient quantities of each type of equipment available on a sustained basis?
- ☐ Is all available equipment capable of operating in the local environmental conditions?
- ☐ Are up-to-date equipment lists maintained? Are they computerized?
- ☐ Are equipment lists available to all responders?
- ☐ Are these lists broken down into the various types of equipment (e.g., protective clothing, monitoring instruments, medical supplies, transportation equipment)?
- ☐ Is there a mechanism to ensure that the lists are kept up-to-date?
- ☐ Have procedures necessary to obtain equipment on a 24-hour basis been identified?
- ☐ Does a program exist to carry out required maintenance of equipment?
- ☐ Are there maintenance and repair records for each piece of equipment?
- ☐ Have mutual aid agreements been established for the use of specialized response equipment?
- ☐ Is sufficient communications equipment available for notifying personnel or to transmit information? Is the equipment of various participating agencies compatible?
- ☐ Is transportation equipment available for moving equipment rapidly to the scene of an incident, and its state of readiness assured?

Facilities:

- ☐ Have facilities capable of performing rapid chemical analyses been identified?
- ☐ Do adequate facilities exist for storage and cleaning/reconditioning of response equipment?
- ☐ Have locations or facilities been identified for the storage, treatment, recycling, and disposal of wastes resulting from a release?
- ☐ Do adequate facilities exist for carrying out training programs?
- ☐ Do facilities exist that are capable of providing medical treatment to persons injured by chemical exposure?
- ☐ Have facilities and procedures been identified for housing persons requiring evacuation or temporary relocation as a result of an incident?
- ☐ Have facilities been identified that are suitable for command centers?

C.2.6 Emergency Plan

The emergency plan, while it relates to many of the above criteria, also stands alone as a means to assess preparedness at the State and local level of government, and in the private sector. The following questions are directed more toward evaluating the plan rather than determining the preparedness level of the entity that has developed the plan. It is not sufficient to ask if there is a plan, but rather to determine if the plan that does exist adequately addresses the needs of the community or entity for which the plan was developed.

- ☐ Have the levels of vulnerability and probable locations of hazardous materials incidents been identified in the plan?
- ☐ Have areas of public health concern been identified in the plan?
- ☐ Have sensitive environmental areas been identified in the plan?
- ☐ For the hazardous materials identified in the area, does the plan include information on the chemical and physical properties of the materials, safety and emergency response information, and hazard mitigation techniques? (NOTE: It is not necessary that all this information be included in the emergency plan; the plan should, however, at least explain where such information is available.)
- ☐ Have all appropriate agencies, departments, or organizations been involved in the process of developing or reviewing the plan?
- ☐ Have all the appropriate agencies, departments, or organizations approved the plan?
- ☐ Has the organizational structure and notification list defined in the plan been reviewed in the last six months?
- ☐ Is the organizational structure identified in the plan compatible with the Federal response organization in the NCP?
- ☐ Has one organization been identified in the plan as having command and control responsibility for the pre-response, response, and post response phases?
- ☐ Does the plan define the organizational responsibilities and relationships among city, county, district, State, and Federal response agencies?
- ☐ Are all organizations that have a role in hazardous materials response identified in the plan (public safety and health, occupational safety and health, transportation, natural resources, environmental, enforcement, educational, planning, and private sector)?
- ☐ Are the procedures and contacts necessary to activate or deactivate the organization clearly given in the plan for the pre-response, response, and post-response phases?
- ☐ Does the organizational structure outlined in the plan provide a mechanism to review the activities conducted during a response or exercise to correct shortfalls?
- ☐ Does the plan include a communications system/method to disseminate information to responders, affected public, etc.?

- ☐ Has a system been identified in the plan to carry out public information/community relations activities?
- ☐ Has a central location or phone number been included in the plan for initial notification of an incident?
- ☐ Have trained and equipped incident commanders been identified in the plan?
- ☐ Does the plan include the authority for vesting site decisions in the incident commander?
- ☐ Have government agency personnel that may be involved in response activities been involved in the planning process?
- ☐ Have local private response organizations (e.g., chemical manufacturers, commercial cleanup contractors) that are available to assist during a response been identified in the plan?
- ☐ Does the plan provide for frequent training exercises to train personnel or to test the local contingency plans?
- ☐ Are lists/systems that identify emergency equipment available to response personnel included in the plan?
- ☐ Have locations of materials most likely to be used in mitigating the effects of a release (e.g., foam, sand, lime) been identified in the plan?
- ☐ Does the plan address the potential needs for evacuation, what agency is authorized to order or recommend an evacuation, how it will be carried out, and where people will be moved?
- ☐ Has an emergency operating center, command center, or other central location with the necessary communications capabilities been identified in the plan for coordination of emergency response activities?
- ☐ Are there follow-up response activities scheduled in the plan?
- ☐ Are there procedures for updating the plan?
- ☐ Are there addenda provided with the plan, such as: laws and ordinances, statutory responsibilities, evacuation plans, community relations plan, health plan, and resource inventories (personnel, equipment, maps [not restricted to road maps], and mutual aid agreements)?
- ☐ Does the plan address the probable simultaneous occurrence of different types of emergencies (e.g., power outage and hazardous materials releases) and the presence of multiple hazards (e.g., flammable and corrosive) during hazardous materials emergencies?

APPENDIX E

Regional Federal Agency Contacts

The following are contacts at the Regional offices of both EPA and the Federal Emergency Management Agency (FEMA) that can be of assistance in planning and conducting field simulation exercises.

EPA REGIONAL OFFICES (direct inquiries to "EPA Regional Preparedness Staff")

Region I (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont)

John F. Kennedy Building, Rm. 2203
Boston, MA 02203
(617) 565-3715

Region II (New Jersey, New York, Puerto Rico, Virgin Islands)

26 Federal Plaza, Room 900
New York, NY 10278
(212) 264-2525

Region III (Delaware, Washington, D.C., Maryland, Pennsylvania, Virginia, West Virginia)

841 Chestnut Street
Philadelphia, PA 19107
(215) 597-9800

Region IV (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee)

345 Courtland Street, N.E.
Atlanta, GA 30365
(404) 347-4727

Region V (Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin)

230 S. Dearborn Street
Chicago, IL 60604
(312) 353-2000

Region VI (Arkansas, Louisiana, New Mexico, Oklahoma, Texas)

1445 Ross Avenue
Dallas, TX 75202-2733
(214) 655-6444

Region VII (Iowa, Kansas, Missouri, Nebraska)

726 Minnesota Avenue
Kansas City, KS 66101
(913) 236-2800

Region VIII (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming)

999 18th Street, Suite 500
Denver, CO 80202-2405
(303) 293-1603

Region IX (Arizona, California, Hawaii, Nevada, American Samoa, Guam)

215 Fremont Street
San Francisco, CA 94105
(415) 974-8153

Region X (Alaska, Idaho, Oregon, Washington)

1200 6th Avenue
Seattle, WA 98101
(206) 442-5810

FEMA REGIONAL OFFICES (direct inquiries to "Hazmat Program Staff")

Region I

442 J.W. McCormack POCH
Boston, MA 02109
(617) 223-9540

Region II

Room 1338
26 Federal Plaza
New York, NY 10278
(212) 238-8200

Region III

Liberty Square Building
105 S. 7th Street
Philadelphia, PA 19106
(215) 931-5500

Region IV

Suite 700
1371 Peachtree Street, N.E.
Atlanta, GA 30309
(404) 347-2400

Region V

4th Floor
175 W. Jackson
Chicago, IL 60604
(312) 431-5500

Region VI

Federal Center
Attention Hazmat
800 N. Loop 288
Denton, TX 76201
(817) 898-9399

Region VII

911 Walnut Street, Room 200
Kansas City, MO 64106
(816) 283-7063

Region VIII

Denver Federal Center, Building 710
Box 25267
Denver, CO 80225-0267
(303) 235-4811

Region IX

Building 105
Presidio of San Francisco, CA 94129
(415) 923-7100

Region X

Federal Regional Center
130 228th St., S.W.
Bothell, WA 98021-9796
(206) 481-8800

APPENDIX F

References to Additional Information

The following sources have been used as background information in the preparation of this Technical Assistance Bulletin and may be useful in planning specific exercises:

- U.S. Environmental Protection Agency
  Environmental Response Team (ERT)
  26 W. St. Clair St.
  Cincinnati, OH 45268
  (513) 569-7537

  The ERT has considerable experience in planning and evaluating field exercises. They can assist directly in state and local exercises; alternatively, they have resource material (e.g., sample scenarios and checklists) that can be used.

- U.S. Environmental Protection Agency, Region VII Technical Assistance Team: "The Day Before...Chemical Response Planning Through Simulation, A Production Guide." Contact: Regional Preparedness Staff at (913) 236-2800.

  A very useful, hands-on guide to planning and conduction field simulation exercises.

- Federal Emergency Management Agency: "Exercise Design Course Guide to Emergency Management Exercises." (See **Appendix E** for FEMA Regional contacts.)

  Although this was prepared as an accompaniment to a course taught by FEMA, it is also useful as a stand-alone introduction to designing all types of emergency exercises.

- National Response Team: Hazardous Materials Emergency Planning Guide (NRT-1), March 1987. Contact National Response Team at G-WER/12, 2100 2nd St., S.W., Washington, D.C. 20593.

  This is the Federal "bible" on planning for hazardous materials emergency responses. It is intended to provide state and local agencies with very specific guidance in their own planning efforts. Will be helpful in evaluating the results of a field simulation exercise and in linking exercises to an effective planning process.

EXAMPLE SIMULATION EXERCISE SCENARIOS

Scenario 1: Anhydrous Hydrogen Fluoride Spill During Transfer Operations

XYZ Chemicals, Inc., produces a small line of acids for sale in the manufacturing and trade markets. XYZ stores and handles a variety of chemicals on-site for use in its own processes; in addition, XYZ products are often stored on plant grounds pending shipment to customers.

XYZ's Lake City plant is located in a neighborhood characterized by a mix of industrial and residential land uses. Local industrial facilities include two large steel plants, an oil refinery, and numerous specialty chemical plants. The XYZ facility itself is bounded on the north by a spur of the Union Railroad; on the south by the Grand River; on the west by Elm Street and a rail line; and on the east by First Street. Beyond the River on the south is an interstate highway that is heavily traveled. Within two miles north of the plant are seven schools and a hospital. Just north of the plant, across the Union tracks, is a residential neighborhood; additional residential zones of Lake City and Middletown lie one and one-half miles to the south and southwest, and three miles to the southeast.

Returning from their noon break, two XYZ workers resume the task of transferring anhydrous hydrogen fluoride (AHF) from a pressurized rail car to a 15,000 gallon outdoor storage tank at a transfer point 200 yards from the main part of the plant. They had allowed the transferring pump to operate unattended and find upon returning that the failure of an automatic shutoff valve has resulted in a spill of approximately 1000 gallons of AHF. The liquid AHF has begun to pool, giving rise to vapor. Inhaling these vapors, both workers suffer severe respiratory injury. Although one worker collapses immediately, the other succeeds in activating the plant safety alarm, thereby alerting the shift supervisor that an emergency has occurred at the transfer site.

The supervisor drives to investigate the accident. Smelling the strong presence of AHF vapors in the air, the supervisor stops his vehicle 200 feet from the accident site and radios the plant gate to notify the Lake City emergency response authorities by calling 911. In the process of suiting up with protective equipment, the supervisor himself collapses.

Scenario 2: SO_3 Spill From Severed Feedline

The PQX Chemical Co. plant, located on Lee Highway in Blackrock City, manufactures a variety of corrosive, toxic, and flammable chemicals. Many of these chemicals are stored at the plant pending shipment to customers.

The Blackrock plant occupies 50 acres of land and is situated in an area composed of commercial, industrial, and residential land uses. The plant property is bounded on the north by Lee Highway; on the east by a rail line; on the south by Interstate 20; and on the west by the Black River. Beyond the river to the west, is the Black River Estates housing development. South of Interstate 20 is the Clover Hill housing development. On the north side of Lee Highway lies a mixture of commercial and industrial buildings. East of the railroad line, there are a variety of industrial facilities. A railroad siding extends into the plant property to the outside storage area.

One clear Saturday morning, a day when the plant is not operating, a repair crew is working on replacing a section of pipe that is connected to the top of an empty tank. After disconnection, a crane is used to lower the pipe onto a flat bed truck. As the crane boom is swung over a nearby tank of liquid sulfur trioxide, the cable snaps, dropping the pipe. The falling pipe shears off the SO_3 tank's feedline between the tank wall and the first block valve. The four-inch diameter feedline leading from the tank to the process plant begins leaking immediately. An excess flow valve between the leak and the tank limits the rate of flow to 30 gallons per minute.

Spilled liquid SO_3 collects within the containment dike surrounding the tanks. Upon contact with the moisture in the air, the spilled SO_3 vaporizes into a white mist resembling steam. The wind, coming from the northwest at 5 mph, blows the vapors directly onto the nearby repair crew that had removed the old piping. Three of the four repairmen are overcome by the vapors, with two of them lying unconscious on top of the tank on which they had been working. The lone conscious repairman drags the remaining worker from the hazardous area and then runs into the main plant to report the accident. Experiencing burning eyes and difficult breathing, he decides to remain indoors awaiting the arrival of the fire department.

Scenario 3: Petrochemical/Chlorine Spill From Truck/Train Collision

Alpha Transfer Depot, Inc., facilitates the transfer of various bulk commodities from trains to trucks for local delivery within the Junction City metropolitan area. Alpha's specialty is the bulk handling of petroleum and hazardous substances.

Alpha's facility is located adjacent to a regional train yard. Alpha's facility and the train yard itself are bounded by an interstate highway, which serves as a commutation route between Junction City's outlying suburbs and its Central Business District (CBD), and Small Creek, which is a tributary of Big River, which in turn flows through the CBD. The neighborhood surrounding the depot and train yard, which are 3 miles from the CBD, is primarily a run-down industrial/warehouse district. On the opposite creek bank, however, is a large mobile home park primarily populated by elderly and low-income people.

At 6:00 on a warm summer morning, an Alpha delivery truck carrying a full load of 55-gallon drums containing various petrochemical products accidentally collides with a slow-moving haul train towing 2 tank cars of liquid chlorine. Both tank cars derail, with substantial denting and a puncture occurring to one, resulting in a rapid leakage of chlorine. The truck overturns, spilling and rupturing many of its barrels with a resulting leakage of a significant quantity of petrochemicals. Light, directionally variable winds begin spreading chlorine fumes. Liquid chlorine and petrochemicals begin to mix on the ground.

The accident is observed from a distance by another truck driver who notifies the manager-on-duty. The conductor of the haul train, although shaken and suffering eye irritation due to chlorine fumes, is able to rescue the truck driver, who has been overcome by chlorine fumes, dragging him away from the accident site. The exertion of the rescue and additional exposure to the fumes finally cause the conductor to pass out. Both men are attended to by a skeleton crew of depot workers. Realizing that both the truck driver and conductor are unconscious, and seeing evidence of skin burns, the depot manager calls 911 to ensure that emergency medical personnel and hazmat units are summoned.

Scenario 4: Acid Spill From Ruptured Pipeline

Lakeside Chemicals, Inc., produces a variety of acids for sale as intermediates to other chemical manufacturers. Lakeside stores and handles a wide variety of chemicals on-site, both for process use and in storage for shipment to customers.

Lakeside's plant is located in a neighborhood which is primarily industrial in nature. There are several other industrial plants nearby as well as a number of warehouses. The warehouses are adjacent to port facilities along Muddy River, which carries a significant volume of barge and recreational boat traffic. Lakeside's plant is adjacent to a spur of the IHR Railroad on the north; warehouses on the south and east; and a metal plating facility on the west. Kennedy Boulevard and Eisenhower Avenue, both major arterial streets, intersect one block from the plant gate. Just across the IHR tracks is the Lakeside Community Airport, which provides commuter service to major airports in the region. Muddy River lies a quarter-mile to the east.
The nearest dense residential neighborhoods are two miles distant to the north and west.

At 3:30 on a drizzly weekday afternoon, a charter plane carrying 6 people takes off from the Lakeside Airport. The plane experiences engine trouble and fails to achieve sufficient altitude. The pilot attempts to make an emergency landing on vacant land within Lakeside's plant property. After safely touching down, the plane collides with a pipeline carrying sulfuric acid from a Lakeside storage facility to the IHR rail spur for loading on tank cars. The plane flips over and catches fire 100 yards from the pipeline. The pipeline immediately begins to spew acid, which comes in contact with rain puddles that have formed over two days of rainy weather. Winds are light and blowing from the south.

The incident is observed from a distance by plant workers in the midst of a shift change. One of the workers calls the safety manager, who in turn directs the plant's emergency crew into operation. The emergency crew approaches within 200 yards of the accident scene. Spotting acid fumes rising from the area of the pipeline, the crew stops and radios the safety manager. Informed about the fumes, the safety manager instructs the crew not to approach any closer. He calls 911 to summon the Lakeside Fire Department. There are no immediate signs of survivors from the plane crash.

Scenario 5: Ammonia Spill At A Pesticides Plant

The Green Fertilizer Company manufactures a variety of fertilizers for sale in the retail market. Their Exurbia Township plant specializes in ammonia-based fertilizers, which are produced and trucked to Green's regional distribution centers around the country.

Green's Exurbia plant is located ten miles outside Centerville, a major regional trading center. Exurbia Township is sparsely populated and is characterized primarily by a mix of agricultural and light industrial land uses. Along the western boundary of the is Ample River, which serves as the major source of drinking water for Centerville. In the immediate vicinity of the plant are a large truck stop along an interstate highway, 150 yards east of the plant; and a county farm labor housing project, 300 yards south of the plant.

At 10:00 on a blustery winter weekday morning, plant workers hear a loud noise coming from the vicinity of a pipe carrying Anhydrous Ammonia from a 10,000 gallon storage vessel into the building housing the fertilizer manufacturing process. The pipe has ruptured, resulting in the rapid flow of product onto the ground. Although the Ammonia is rapidly vaporizing, it has also begun to pool. The weather is relatively warm, due to a temperature inversion. Winds are blowing out of the northwest.

A plant worker walks out of the plant building to investigate the noise. Seeing the leaking ammonia and smelling fumes, the worker quickly retreats inside the building and radios the plant safety manager. The plant manager in turn radios the plant emergency response team to report for duty, and calls the Exurbia Township Fire Department to request back-up assistance.

Scenario 6: Nitric Acid/Diesel Fuel Spill At A Munitions Plant

Precision Weaponry Co. manufactures ordnance for sale to the U.S. Government and private companies. Its principal products include explosives and ammunition. Although Precision does store a small quantity of its products on its Middlesex County plant site, it consciously strives to minimize explosion hazards by maintaining minimum inventories.

Precision's Middlesex facility is quite large, with idle ground used as a buffer between production facilities and the plant fenceline. When it was constructed after World War II, the plant was in an isolated location. However, development over the last two decades has introduced a variety of low-density industrial and commercial land uses into the immediate neighborhood. A large retiree mobile home village, located two miles south, is the nearest residential development. The Precision plant lies in the Whisky River Valley, a two mile-wide drainage basin framed by the Saddleback Hills.

At 3:00 one weekday afternoon, a tanker truck delivering diesel fuel to the plant collides with an empty Precision delivery truck. The force of the impact drives the Precision truck into a 20,000 gallon tank full of Nitric Acid stored for use in manufacturing explosives. The Nitric Acid tank begins to leak profusely. The delivery truck immediately catches fire. The diesel tanker truck careens into an adjacent utility building, causing a release valve to open. Diesel fuel begins to leak and mix with Nitric Acid ponding on the ground. Fumes immediately begin forming.

The driver of the diesel tanker is unhurt and is able to climb out of his cab. Immediately assessing the situation, he runs 100 yards to the nearest building to notify plant management. Shortly thereafter, the driver collapses, suffering from respiratory difficulties. The plant safety manager begins to marshall his emergency response team and calls for assistance from the Middlesex County Hazmat Squad.