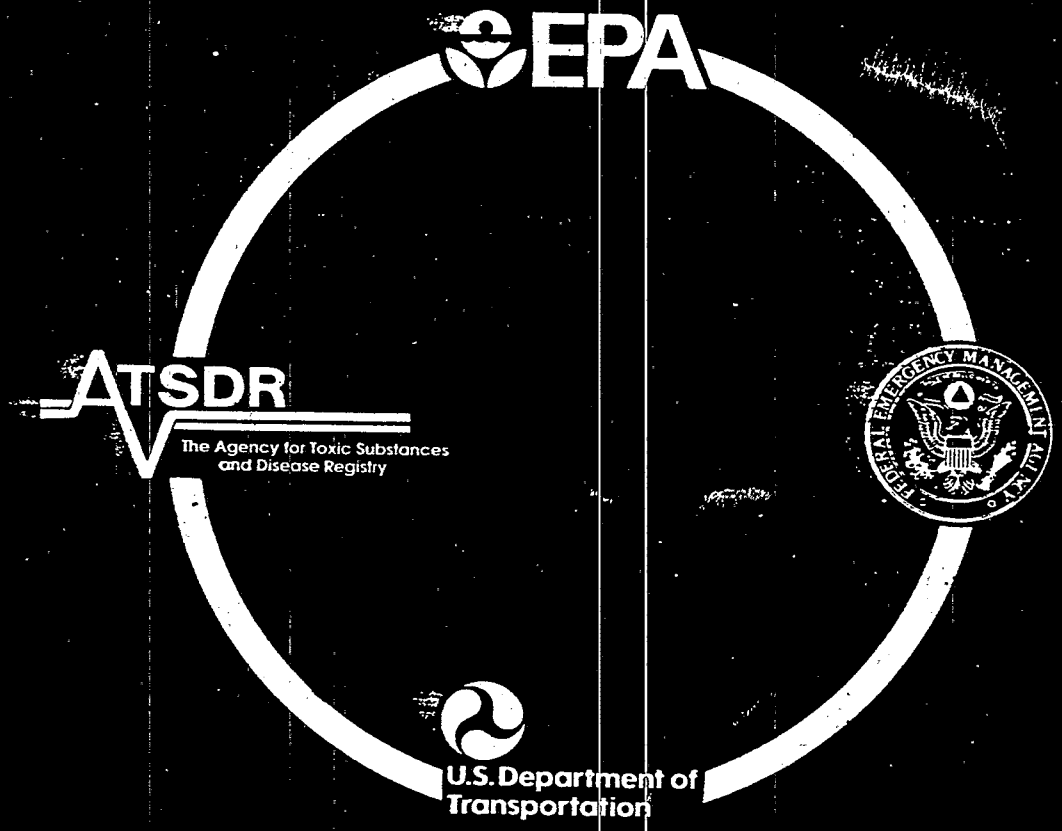
EPA

Risk Communication About Chemicals In Your Community

A Manual For Local Officials



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Risk Communication about Chemicals in Your Community

A Manual for Local Officials

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United States Environmental Protection Agency

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Agency for Toxic Substances and Disease Registry,
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Research and Special Programs Administration,
U.S. Department of Transportation
1989

1 **State Emergency Response Commission:**

Chairperson _____ Phone _____

2. **Local Emergency Planning Committee:**

Chairperson _____ Phone _____

Other Members _____ Phone _____

_____ Phone _____

_____ Phone _____

3 **Emergency Plan:**

Coordinator or Director of Emergency Management for our town/county:

_____ Phone _____

Designated contact for non-emergency personnel who have questions:

_____ Phone _____

4 **Who is authorized to direct citizens to evacuate or take other actions?**

_____

_____

5 **What are the elements of our response plan?**

_____

_____

_____

6 **What are other resources (local, state, federal, university) on which I can call in an emergency?**

_____

_____

_____

7 **Which state agency/official receives reports under section 313?**

_____

8 **Which state agency/official receives reports under section 312?**

_____

Introduction & Purpose

"STATE RATES HIGH IN CANCER RISK FROM FACILITY EMISSIONS"

"PLANT CHEMICAL SPILL FORCES HUNDREDS TO EVACUATE"

Have you seen headlines like these recently? Do they raise questions in your mind? If someone asked you about them, could you answer the questions?

People are becoming more concerned about hazardous materials in their communities and how these materials affect their health and well being. Their concerns become most pressing when there is an accident or a leaking waste site is discovered, but they are also concerned about hazardous chemicals they are exposed to every day. In response to these concerns, local officials are increasingly called upon to respond to questions about hazardous materials, including the risks they pose and how to reduce those risks. For many local officials this is a new role, one for which they may not be fully prepared.

Purpose

This workshop manual will help you learn how to respond to public questions about chemical risks. It also will help you find additional assistance and information about hazardous materials.

Recent federal legislation is likely to increase public awareness and concern especially because of the Emergency Planning and Community Right-to-Know Act, which is Title III of the 1986 amendments to the "Superfund" Act.

Title III is not a typical regulatory program; it is part of an innovative approach to managing environmental risk. It makes a great deal of information available that has never been provided before. The information is available to everyone—to the public and to governments at all levels—about the presence of hazardous chemicals in the community, about accidental and routine releases of these chemicals, and about their storage. The more citizens know about chemical hazards in their communities, the better equipped they and their local governments will be to make decisions and to take actions that will protect their families and neighbors from unacceptable risks.

The new information available under Title III is often complex, and its application and interpretation requires work from all those involved. It will cause citizens' existing concerns about hazardous chemicals to become more focused, and public officials will need to respond to these concerns. Title III establishes an ongoing forum at the local level for community discussion and action about hazardous chemicals. This forum is the Local Emergency Planning Committee, or LEPC.

LEPC members may be called upon to respond to public questions about the risks they are examining or to participate in public meetings about those risks—meetings where people will ask what the information means or about its significance for a particular person or segment of the community. If you are a member of the LEPC or participate in its work, you will be interacting with the community as you work to analyze and mitigate potential chemical hazards. Since LEPC membership by law includes a variety of categories—emergency responders such as firefighters and police, health professionals, the media, industry representatives, transportation representatives, and public interest groups—many different kinds of people with many different backgrounds will find themselves answering public questions. This manual is intended to help everyone who may have to answer questions develop some useful strategies.

Preview

The manual begins with a brief overview of the law and local responsibilities. To illustrate situations and suggest ways to respond, we will look at three kinds of incidents that cause citizens to seek out local officials. We will begin with an accident, then expand our discussion to include more routine events. These are not the only circumstances under which citizens may seek out local officials and become involved in considerations of risk in the community, but they illustrate ways in which public officials might interact with the public.

How to Use This Manual

The manual can be used in three ways: first, as part of a workshop on answering citizen questions about hazardous chemicals; second, as a stand-alone guide for local officials unable to attend a workshop; and third, as a reference.

Objectives

Reading or using the manual will help you:

- Know what kinds of questions citizens are likely to ask
  —after an accident
  —after learning about routine releases
  —after learning that large quantities of substances are stored nearby.
- Know the characteristics of a good answer to these questions.
- Understand the kinds of information needed to answer the questions and where that information may be found.
- Respond to the questions and identify some people in the community who can help answer them.
- Identify opportunities for all sectors of the community to participate in decisionmaking about potential risks from hazardous chemicals.

How the Manual is Organized

The manual is written so that later topics build on material presented earlier. Those using the manual for self-study will need to identify the local and state resources described in this manual.

Resource Guide

This manual should be retained as a resource guide. The materials are arranged so that specific information can be found easily when needed. Specific times to review this manual would be when an accident or a spill happens, when companies submit their required Title III reports on hazardous chemicals, or when the public or the media has concerns or questions to be answered.

Remember, there are many other resources available to help you respond to risk assessment questions and accidents, and the early identification of these resources will help you fulfill your official obligations in a safe and responsible manner.

Introduction to Title III

The Emergency Planning and Community Right to Know Act was included as the third part or title of the Superfund Amendments and Reauthorization Act of 1986. For this reason, it is often called "Title III." The law has four purposes (readers should not use the following brief descriptions as the basis for legal decisions about Title III):

(1) **Emergency planning.** Facilities that store or use any of the 366 Extremely Hazardous Substances in excess of the threshold planning quantity (TPQ) report this fact to the State Emergency Response Commission (SERC) and LEPC. The LEPC develops an emergency plan based on this and other information.

(2) **Emergency release reporting.** Facilities must report to the SERC and LEPC accidental releases in amounts over a reportable quantity of the Extremely Hazardous Substances and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) hazardous substances (which must also be reported to the National Response Center).

(3) **Hazardous chemical reporting.** Facilities where any hazardous chemicals are present in amounts over certain reporting thresholds (often 10,000 pounds) must submit Material Safety Data Sheets (MSDSs) or a list of chemicals for which MSDSs are required as well as an annual chemical inventory form to the local fire department, LEPC, and SERC.

(4) **Creation of an emissions inventory.** Manufacturing facilities that use any of a different list of about 300 chemicals in excess of reporting thresholds must report emissions to EPA and designated state agencies.

As indicated, different sections of the law apply to different facilities and different chemicals. Specific sections are listed in Appendix 3.

In order for the law to work, industry, interested citizens, environmental and other public-interest organizations, and governments at all levels must work together to plan for chemical accidents and to reduce the risk to the public from releases of toxic chemicals into the environment. The law represents a path-breaking approach to environmental protection, because it assumes that the more citizens know about chemical hazards in their communities, the better equipped they and their communities will be to make decisions

and take actions to protect their families and neighbors from risks they feel are unacceptable.

Special Provisions for Local Government Officials

Provisions of special concern to local officials include:

—The law required states to set up State Emergency Response Commissions, or SERCs.

—SERCs were then required to establish local emergency planning districts and Local Emergency Planning Committees, or LEPCs.

—LEPCs must include among their members local elected officials and staff with competence in health and emergency response, industry representatives, media representatives, and members of citizens groups.

—Facilities having more than certain quantities of any of the 366 Extremely Hazardous Substances must make themselves known to SERCs and participate in the LEPC.

—As noted, facilities where hazardous chemicals are present in certain quantities must submit MSDSs and inventories of the chemicals to SERCs, LEPCs and local fire departments. An MSDS describes the physical and chemical properties of the substance as well as its health effects, appropriate safety equipment, and emergency response measures.

—LEPCs must make the chemical inventories and the MSDSs available to citizens who want to see them.

—LEPCs must develop a plan for responding to and avoiding emergencies involving hazardous chemicals, drawing upon the chemical inventories and other information provided by facilities.

—Manufacturers must report their annual emissions of certain toxic chemicals into the air, water, or land. The reports are sent to the federal Environmental Protection Agency (EPA) and to the designated state agencies. Citizens also have access to these reports.

The information now available to citizens under Title III is one of the driving forces for citizen questions about hazardous materials in the community. Sections below describe three scenarios in which citizens have obtained Title III information.

Defining Terms

Title III makes use of three terms that often seem similar. They are:

Toxic - substances that are poisonous or can cause adverse health effects. These are the substances emissions of which are reported under Section 313 of Title III.

Hazardous - substances that are toxic, corrosive, flammable, or explosive. This is a general term, not specific to Title III.

Extremely hazardous - a set of chemicals defined by Title III as subject to reporting under Section 302, because they could cause death or irreversible damage after relatively short exposure to small amounts, generally in air.

As you talk with citizens, it is important to remember that they may not know the differences among these terms as well as you do. Listen to understand what they mean instead of concentrating on the particular terms they might use.

We know that citizens are often very concerned about toxic and hazardous chemicals in all these categories. Title III offers an important new step forward in allowing and encouraging citizens, working with government and industry, to participate in managing these chemicals in their own communities.

What is Risk?

"Risk" is a word that is used often when people talk about hazardous chemicals in the community.

What is risk? A convenient definition is:

The likelihood of injury, disease, or death.

Environmental risk then refers to

The likelihood of injury, disease, or death resulting from human exposure to a potential environmental hazard.

(In addition to human health, the environment itself may also be at risk. We will not mention these risks below, but the considerations are the same.)

Experts often use the definitions above. When experts are asked to describe or characterize a risk, they use statements like these:

Common Risk Characterizations

- There is a lifetime risk of 1 in 65 of dying in a motor vehicle accident.
- The range of risks in humans is between 100 and 1000 cancers per 1,000,000 people exposed.
- The chance of getting this disease is 1×10^{-7} (1.10-millionth, or 1 in 10 million.)
- The risk to children is high relative to that for adults.
- 25,000 people die each year from at-home injuries.
- The risk of death from leukemia is 1 in 12,500 people per year.
- The risk of cancer from indoor air is 600 times the risk from tap water.
- An airplane crash involving 100 or more deaths is likely to occur once in two years.

- The risk to this neighborhood from chemical releases at Facility A is likely to be higher than the risk to a different neighborhood from releases at Facility A.

- The risk of neighbors getting sick is higher with this waste disposal site here than it would be if the waste were not disposed here.

Experts tend to focus on the likelihood of a particular risk, but non-experts tend to think of other characteristics of the risk.

For example, an industry representative at a public meeting about a proposed new incinerator reported that a person who spent her whole life downwind of the incinerator would incur a risk that was smaller than the risk from dying her hair. A member of the audience stood up to say, "Yes, but I choose to dye my hair, while I don't choose to live downwind of the incinerator, and furthermore, I get some benefit from dying my hair, while I get none at all from the incinerator." This woman was reacting to the involuntary nature of the risk and the perceived balance between risks and benefits.

Table 1 on the next page illustrates some of the other features of risk that make it seem "riskier" to most people and gives brief examples.

Table 1: Characteristics of Risk
(Factors on Right Increase Perception of Riskiness)

Voluntary Driving a car	<——>	**Involuntary** Breathing air polluted by a neighboring factory
Natural Radon in basement	<——>	**Man Made** Industrial chemicals
Familiar Household cleansers	<——>	**Exotic** Genetically engineered organism
Chronic Routine small releases of chemicals from a facility	<——>	**Catastrophic** Large accidental release of chlorine gas from a plant
Visible Benefits Dying hair	<——>	**No Visible Benefits** Incinerator effluents
Controlled by Individuals Driving	<——>	**Controlled by Others** Industrial pollution
Fair	<——>	**Unfair**

The notion of "fairness" sums up many of the other aspects of risk that make people feel special concern or "outrage." If a person or community feels that it is bearing a lot of risk while someone else is getting most of the benefits, then the risk will seem especially unacceptable. Risk communicators must understand these feelings, or they will not succeed in working with the community to make good decisions about risk reduction.

We also know that most people seek information about hazardous chemicals only when something happens to make them interested or cause them to believe that they are directly affected.

Questions citizens ask about hazardous materials

We will use as examples three kinds of circumstances that may cause citizens to become concerned enough about hazardous chemicals in their communities to ask questions: during/after an incident, when they learn about routine releases, and when they learn about the many kinds of substances stored nearby. Most questions will concern human health, but many citizens also will ask questions about environmental and other possible effects of chemical exposure or release. In addition to these substantive questions about health or the environment, citizens also ask many "procedural" questions about where they can obtain additional information, why it was so difficult to get answers to their questions, or how they can get involved in making sure risks are managed properly.

Few public officials will be able to answer all these questions. Some questions have no sure answers, and others can be answered only in light of the particular conditions prevailing in the community. However, this manual is intended to help users understand the kinds of answers that are appropriate and find sources for the factual information that is available. Keep these questions in mind as you think about the scenarios from the perspectives of government, industry, or citizen representatives

Scenario 1

Unplanned Release of a Chemical

About 2:30 on a weekday afternoon you receive a telephone call from the Director of Emergency Management telling you that a chlorine tank in the basement of the local school has sprung a leak and that the gas, which is very dangerous, has entered the indoor swimming pool area and gym and is being sucked into the school's air circulation system. The tank has been removed from the basement to the open air and the leak is being repaired; emergency personnel are moving rapidly through the school to locate and rescue students and teachers; local hospitals have been notified; and vehicles are on their way to the school to transport anyone suffering impaired breathing.

Within fifteen minutes, your telephone starts ringing with questions from frantic parents and the media. What should you say to them? As an LEPC member, you would refer calls to the appropriate emergency response public contact. But what if you are that person? Or what if you have to answer "spillover" questions because you are on the LEPC or in another position in which people are likely to call you?

Procedures with Hazardous Chemicals

To answer people's questions, you must first know about the plans and procedures for emergencies involving hazardous chemicals.

1. SARA Title III requires any facility that stores any of 366 Extremely Hazardous Substances in amounts greater than specified Threshold Planning Quantities to notify the Local Emergency Planning Committee (LEPC) and the SERC. (Many of these substances are also covered by the annual toxic chemical reporting requirements of Title III described above on page 4.) A list of the Extremely Hazardous Substances appears in Appendix 5.

2. The LEPC uses this information to plan for accident prevention and for emergency response in case of an accident. Individual facilities also should have their own emergency response plans.

For some chemicals, including chlorine, there are professional standards for the kinds of emergency warning systems and emergency equipment that should be on hand.

3. The local emergency plan developed by the LEPC should:

Some Steps in the Emergency Plan

- Designate a coordinator for emergencies—usually the Director of Emergency Management or someone in the Fire Department. (Note that many states have rules about first responders that should have been considered as the plan was developed.)

- Provide a means for notifying appropriate authorities.

- Provide a means for emergency responders to obtain information about appropriate responses particular to specific chemicals involved in the incident (including needs for special equipment and clothing).

- Identify sources of necessary equipment and trained personnel and describe procedures for bringing them to the site.

- Specify the division of duties between the public and private sector response personnel. (Many companies insist on deploying their own specially-trained staff for accidents that do not cross the plant boundary, in part to limit possible liability for damages to non-employee emergency responders).

(Although cities or other jurisdictions smaller than the area covered by the LEPC could have their own plans, in this manual we focus on the LEPC plan. The planning principles would be the same for the smaller jurisdictions.)

Citizens' Questions

In the chlorine spill, the plan has worked quite well. Authorities, including you, have been notified, equipment mobilized, and the problem treated. Your callers ask:

a. What's going on?
b. Am I at risk?
c. Should I evacuate?
d. What are you doing to mitigate the consequences?

Although citizens will call the elected official, he is not necessarily the best person to provide answers. **The person designated as emergency coordinator should** in turn **have designated a particular person or position in his office to be the contact for non-emergency personnel who have**

questions. This person's name and especially phone number should be emphasized to the media before any accidents occur. (Many facilities are designating a particular contact person and inviting the media to meet with that person on an informal basis independent of any particular events. Public agencies could adopt this approach, ensuring that the media are aware of procedures and plans.) The elected official should refer almost all calls to the appropriate contact person, since during an emergency, it is often impossible to ensure that every office is kept up to date on rapidly changing events.

Where to get information to answer these questions.

Local officials should know about the system in place in their own communities for emergency planning and response and be prepared to talk about it with the public. You should know the answers to these questions:

a. Who is the central contact person or where information will be available?
b. Which departments, programs, or offices are responsible for emergency response?
c. Who has authority to direct citizens to evacuate or take other action?
d. What is their relationship to the Local Emergency Planning Committee (LEPC)? Who is chairman of the LEPC and what is the role of the LEPC during an emergency?
e. What are other sources of information to answer citizens' questions?

In short, officials need to be familiar enough with local procedures to be able to tell callers where to find the information they need right away. It is important to identify the LEPC and local emergency coordinators in advance. (The State Emergency Response Commission is a resource that should be used during the planning period and not during an emergency - see Appendix 4.)

Questions after the event

Another series of questions will arise after the event. Among the most likely to be asked are:

a. How did this happen?
b. How long will the "short-term" health effects (those that show up within a few weeks of the incident) continue to be felt?
c. Will we have other health effects that do not show up for a long time?
d. What are you doing to prevent it from happening again?

Of course, the answers differ for each incident. [Appendix 2 lists some sources for information about specific chemicals.] In answering what is being done to prevent a similar accident from occurring, officials may need to refer to state and local laws that give them power to prevent accidents, such as inspections for enforcing the building code.

For this incident, an official might issue a statement something like this:

Sample News Release

News Release

For release, Tuesday 9:00 AM. Office of the Mayor.

About 100 pounds of chlorine gas were accidentally released in the basement of North High yesterday when a storage tank began to leak during routine transfer of chlorine to the pool-cleaning system. The gas was sucked into the air circulation system of the school, which was turned off five minutes after the leak was detected. All 1100 people in the building were outside within fifteen minutes. Although some people experienced difficulty in breathing for several hours, and twenty people were treated at the hospital, no one was admitted and no one is experiencing after effects now.

Chlorine can affect human health in two ways. In high concentrations that may be present during accidents, it causes difficulty in breathing, choking, coughing, chest pain, and sometimes nausea and vomiting. It also reacts with moisture, including body moisture, to form acids that are very irritating to skin, eyes, and mucous membranes. In yesterday's incident, no one suffered any skin irritation because concentrations except in the basement were not high enough. Once the symptoms of chest tightness or difficulty in breathing have disappeared, there are no further health problems that we are aware of associated with an exposure to chlorine.

Our city has a plan in place for responding to emergencies involving hazardous chemicals. This plan worked well, with efficient and effective response by the Fire, Emergency Management, and Volunteer Rescue teams, although the first person calling to report the accident had some trouble finding the right telephone number and right place to report. The city has had a plan since 1973, but it has been revised and updated recently by the Local Emergency Planning Committee. This committee was established under a federal law that calls for emergency planning and public access to data about hazardous chemicals.

In order to limit the likelihood that any further such incidents will occur, the

School Board has agreed that transfer of chlorine will no longer be done during school hours. Chlorine is also stored in large quantities at city swimming pools and water and wastewater treatment plants. We have reviewed our systems for detecting leaks and made sure they are all working properly. We have also issued instructions that transfers of chlorine at city pools will only occur when the pools are closed for the day and will be made only by trained personnel. Finally, we have tried to publicize the telephone number to which initial accident reports should be made: it is 333-3333.

Characteristics of a good answer

To prepare a good answer:

—describe the incident, the response, and other events

—describe the chemical itself, including short- and long-term health effects of brief exposure at relatively high levels

—describe the health effects suffered in the incident and any longer-term concerns

—summarize the good and bad points of the response

—describe actions being taken to reduce the likelihood of a similar incident

There are a variety of sources of information about chemicals, including their physical properties and possible health effects. Some of these sources are listed in Appendix 2. Many public libraries and local emergency response departments have reference books that provide some of this information. The Material Safety Data Sheets (MSDSs) that facilities must supply to the LEPC on request also contain this information. EPA and several private companies maintain computerized databases with chemical information. CAMEO™, a computer program developed with assistance from EPA, contains information about more than 2700 chemicals. The National Library of Medicine has toxicological information in computer databases called TOXNET. These sources seldom contain any information about long-term health effects of exposures that may occur during an accident, because it is often the case that little is known about them.

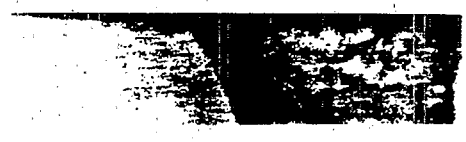
Summary

Citizens' concerns about an accidental release of a chemical focus first on response to the emergency. Later, citizens want to know what is being done to prevent a similar emergency from arising again, and they want to know more details about the health effects of exposure to the chemicals involved in the accident. Prior to any incidents, local officials should ensure that

—a plan has been developed
—a central source of information for the public has been designated,
—they are aware of the procedures to be followed during an emergency. (Filling out the Risk Communication Resource Sheet at the beginning of the manual will help meet this guideline.)

After incidents, local officials should be prepared to

—provide an evaluation of the effectiveness of the plan
—provide available information about health effects of the chemical
—provide information about how citizens can become involved in emergency planning and risk reduction through the LEPC.



Scenario 2

Learning about Routine Releases

As a result of the incident in scenario 1, the local media become very interested in the hazardous chemicals in the community. They obtain emissions reports from the state agency assigned the responsibility of keeping them or from EPA, which maintains the Toxic Release Inventory (TRI) database. The TRI can be accessed through the National Library of Medicine's TOXNET system. The following newspaper article is an example of the kinds of information being publicized.

Ourcity Daily News

325,000 Pounds of Four Toxic Chemicals Emitted Locally

Benzene, Chlorine, Pyridine, Ammonia Most Prominent
Industry Says, "Risk is Low"

Last year, fifteen local manufacturing facilities emitted more than 10,000 tons of toxic chemicals into the air, water, and land of Ourcity. The top chemicals emitted (in pounds) were benzene (200,000), chlorine (100,000), pyridine (10,000) and ammonia (15,000).

Benzene is a known carcinogen. Chlorine is a highly toxic chemical that may cause severe respiratory problems. Chlorine was involved in the recent accident at the North High School, causing evacuation of 1100 students and teachers. Pyridine is a reproductive toxin, causing possible damage to reproductive organs, as well as having serious effects on the central nervous system. Ammonia, a common household cleaner, is irritating to eyes and the respiratory system.

Newspaper staff examined reports submitted by fifteen local manufacturing facilities under the requirements of a federal law, the Emergency Planning and Community Right to Know Act. The federal Environmental Protection Agency requires facilities to disclose the amount of toxic chemicals they release into the environment each year.

In addition to benzene, chlorine, pyridine, and ammonia, local facilities emit more than 500,000 pounds per year of ethylene, creosols, formaldehyde, and twelve other chemicals.

Tom Jones, senior safety engineer for Newtown Chemical Company, noted that the emissions reported do not give cause for any alarm. Benzene emissions by all fifteen companies, he said, are only one-tenth of the benzene given off by automobiles in Ourcity. Jones also pointed to a recent study by the State Environmental Department which showed that total concentrations of benzene and seven other chemicals in

Ourcity are well below state standards. In Ourcity, they have been measured at about 20 parts per billion at the intersection of Broad and Main Streets.

Rodney Smith of the State Environmental Department stated that the department will be looking more closely at the emissions to see whether they violate any state standards. "For now," he said, "we are just happy to see the companies providing the reports, complying with the law. Later we will use the data to examine whether we need regulatory changes."

Citizens' Questions

After reading such a news article, the questions that people are likely to ask local officials include:

(1) What risk is posed by these exposures?
(2) Are these emissions the cause of (various health symptoms)?
(3) Why are the plants allowed to emit these substances?
(4) Was the facility in compliance with state and federal laws?
(5) Are there other facilities in the area that have not reported that also are emitting these substances? Should they be reporting too?
(6) What other sources might lead to my being exposed to these chemicals?

Emissions vs. Exposure

To answer the first two questions, we need to know about

- emissions, concentration, exposure, and dose
- toxicity
- acute, high-level vs. long-term, low-level exposures
- immediate vs. delayed risks

To answer questions 3 and 4, officials should know a little about the present system for regulating emissions, the procedures for getting information under Title III, and how citizens can begin to work with industry to reduce emissions if that is what they want to do.

An **emission or release** is the amount of a substance released from a facility. Releases are usually classified either as *routine*—small regularly released amounts that are planned to be released as part of a manufacturing process—or as *accidental.*

Just because a facility emits some amount of a substance does not mean that it affects anyone. Substances are diluted as they are released into the air and water. The **concentration** is the amount of the substance in a representative unit of the air, water, or land. For example, due to automobile exhaust, benzene may be found in the air of many cities in a concentration of about 8 parts per billion. The concentration is, of course, higher if emissions within a fixed time are higher and other conditions remain the same. Concentrations also will tend to be higher closer to the emission source.

Exposure happens when an individual comes in contact with a substance Exposure can occur through breathing, drinking, eating, and by direct skin contact. The amount of exposure is determined by many factors, including the concentration of the substance in the environment, how long the contact lasts, and how often the exposure occurs.

Figure 1 shows the paths by which emissions might lead to exposure. At each point, there are difficulties in determining how much a person is exposed. This makes it hard to estimate the risk.

Dose is the amount of the substance that actually enters the body. The dose is related to exposure, but differs according to individual susceptibilities and habits. The dose received from a hazardous chemical in the environment is influenced by the concentration, route of entry, length of exposure, presence of other chemicals, and the ability of the body to break down the substance.

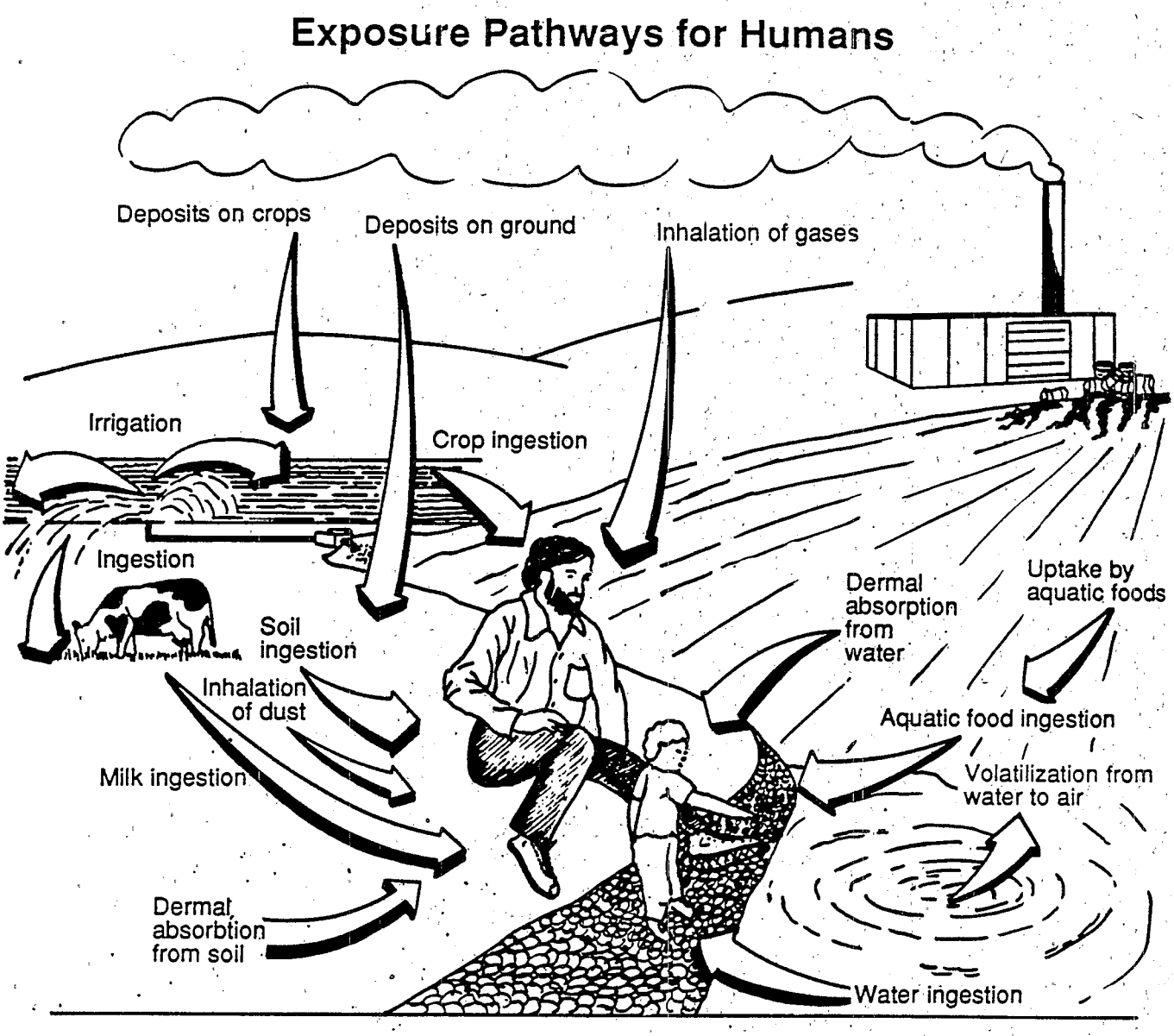
Characteristics of the chemical

Toxicity is a measure of how harmful a substance is to human health or to plants or animals. Highly toxic substances have adverse health effects at smaller doses.

An **acute** exposure is one that occurs over a short period of time. It could be a large exposure such as might occur during an accidental spill.

Long-term exposure can occur when a substance is present in the environment over an extended period.

Figure 1



From "Assessing Risk at Superfund Sites," prepared by CH2M HILL

Acute or short-term exposures may have **immediate or acute** effects and may have long-term effects. The immediate effect of the chlorine was to cause people to gasp and choke. We do not know about any delayed effects of acute exposures to chlorine.

Long-term, low level exposures also may cause health effects. Usually these are **delayed** health effects that may not show up for many years. Cancer and birth defects are often delayed health effects.

Determining delayed health effects

The ways in which we learn about delayed health effects make it difficult to discuss them with any certainty.

Most of our information about delayed health effects comes from laboratory studies conducted on test animals. Usually more than one species is used. Animals are exposed to the substance in different ways, including eating, drinking, breathing, or on the skin, and different groups are exposed to different quantities. After some time, animals are examined to see whether there are abnormal cells or other evidence of harm. The number of these abnormalities in the test animals is compared to that in unexposed control animals. Statistical tests are used to determine whether the difference between the test animals and the controls is "significant," or suggests that the substance may have a health effect.

Many people disregard laboratory studies because animals are exposed to quantities of the substance that are so much higher than humans ever would receive. Laboratory studies are done this way in order to reduce the number of test animals used and the time needed for the study; otherwise, studies would be prohibitively expensive. Results from the high doses are used to predict what would happen at more realistic doses. These results may tell us approximately how many people will get sick or die from particular exposure levels, but they can never tell us which people will be affected.

Some laboratory studies are conducted on tiny organisms in test tubes. Scientists have learned that substances that affect the growth of these organisms often have adverse human health effects. Usually these "in vitro" ("in glass") studies are used to screen chemicals; those that seem suspicious are further tested on animals ("in vivo").

Epidemiological studies use data about humans who have been exposed to a substance and data about their health to try to determine whether a substance causes health problems. Such studies are often difficult to interpret because people are exposed to so many substances throughout their lives and because the health effects of interest may not occur for many years. Combined with laboratory evidence, however, it is often possible to show that certain exposures cause unwanted health effects in humans.

Because the evidence about long-term effects, when it is available at all, is based on laboratory and/or epidemiological studies it is often open to different interpretations. There is never full proof about the cause of such effects. This may create political controversy between people who believe the chemical creates a risk for those exposed and those who believe that the evidence is not good enough to suggest that there is a risk. Citizens who want to discuss these questions should be referred to appropriate experts. Officials should try not to get caught in such arguments. Instead, they should try to present whatever facts are available and provide ways for opponents to work together to achieve acceptable policy solutions.

Answering health effects questions

Now we can turn back to some of the questions citizens ask:

1) What risk is posed by these exposures?
2) Are these emissions the cause of (various health symptoms)?

1) What risk is posed by these exposures?

The word "risk" often carries different meanings for different people. In communicating with the public, it is usually not helpful to say, "the risk is high" or "the risk is low."

The factors contributing to the risk include:

Factor	Example
Quantities	How much effluent was released
Concentrations	Parts per million
Exposures	How much is likely to be absorbed, inhaled, drunk
Probabilities	How likely is it to happen

Risk levels	Expected number of deaths or disease per year
Toxicity	How strong is the effect of exposure on human health

(Adapted from Hance, Chess, and Sandman, "Improving Dialogue With Communities" p. 64.)

In answering questions, people often confuse these factors when attempting to put risks into context. In addition to these risk factors, other characteristics we have noted on page 8 affect people's perceptions of risk, including how fair the risk seems to be, who benefits and who bears the risk, and whether the risk is voluntary or easy to understand.

One way to talk about risks of exposures is to provide:

1) A description of known health effects.

2) Any information about concentrations or levels of exposure.

3) Any comparisons of these concentrations with existing government standards or other directly comparable information. (Caution: Be careful when providing comparisons with risks from other chemicals or activities. For example, avoid making comparisons between risks such as drinking water containing hazardous chemicals and the risk of driving an automobile. Comparing dissimilar risks often makes citizens angry, especially when the comparison is between an involuntary risk such as drinking water containing hazardous chemicals emitted by a facility and a voluntary risk such as driving. However, people might find it useful to hear a comparison of similar risks of two chemicals, both of which are found in drinking water. The Covello, Sandman, and Slovic book mentioned in Appendix 2 gives other good examples.)

4) In addition, people like to know why the chemical is present in the community—that is, what it is being used for. Remember, familiar risks are likely to be perceived as less risky than unfamiliar or exotic ones. The multi-syllabic name of a chemical, in contrast, might increase concern.

A public official confronted with questions about benzene emissions might state the following:

"Benzene is a chemical found in many common products such as gasoline and often used in making plastics, textiles, rubber, and solvents. It is known to cause leukemia if people are exposed to it at levels of hundreds of parts per million over many years. In our town, concentrations in the air are about 20 parts per billion. Because this is about 400 times lower than exposures known to cause leukemia, scientists do not know what kinds of health effects might result from exposures at this level. In other cities that do not have factories emitting benzene, concentrations in the air average about 9 parts per billion, because both automobile exhaust and other everyday activities such as pumping gasoline result in benzene emissions too."

For a substance with less well-documented effects, a statement might include the following:

"We have recently found trichloroethylene (TCE) is a chemical that is emitted by local facilities into the water. TCE is used by these facilities as a solvent and a compound in cleaning fluid and typewriter correction fluid. In some laboratory tests on mice, TCE has been shown to have reproductive effects at levels hundreds of times higher than the levels found in our drinking water. We just do not know what effects exposure at lower levels may have."

2) **Are these emissions the cause of my unwanted health effects?**

Causation is the most difficult question officials are called upon to consider. Except in well-conducted laboratory experiments, causation is almost impossible to prove. Workers who develop certain rare diseases after being exposed to relatively high concentrations of workplace substances known to be associated with those diseases can reasonably say that workplace exposure caused their problem. Otherwise, it is almost impossible, since people are exposed to so many different substances in so many different ways. Again, laboratory studies suggest the rate at which people will experience the unwanted health effects, but can never tell which individuals will get sick.

Other Sources for Referral

Local officials should know how to get more information, including specialists to whom they can refer these more specific questions.

• Several books are available in most public libraries. Among them is the Concise Chemical Dictionary. Appendix 2 lists some others.

•Local health department officials may not have the necessary expertise but will know appropriate health officials at the state level.

•Local universities have professors who are familiar with the issues surrounding identification of long-term health risks.

Technical experts often anger people by emphasizing the difficulties in establishing causation or the extent of scientific uncertainty. Nevertheless, policy or legal decisions must often be made even when these uncertainties exist. Sometimes it is useful to respond to questions about individual symptoms and emissions or exposures with four kinds of statements:

Additional Responses

• Our scientific knowledge is not good enough for us to say whether these exposures cause your symptoms.

• You can try to reduce the exposures by. . . (give specific relevant directions such as drinking bottled water, keeping windows closed, etc.)

• (If appropriate) Emissions constitute only a small portion of most people's exposures.

• You have an opportunity to work with industry to reduce these emissions through the LEPC.

How Safe Am I?

Perhaps the most common question asked is some form of:

How safe am I?

As noted, individual exposures differ and individual susceptibilities also differ. More important, individuals' willingness to assume risks differ widely. In other words, safety is a relative term. This is especially true when we consider the non-quantitative aspects of risk, such as perceived fairness or controllability. Local officials can provide information about risk measurement, but each person must decide for himself or

herself whether a risk is acceptable—that is, whether something seems "safe."

Without supplementary information, the emissions data available under section 313 of Title III cannot answer questions about safety. The data can help people choose the facilities, media (air, water, land), or chemicals about which they would like to know more, however. Among the other information that would help determine whether the present level of safety is adequate (or the present level of risk is low enough) are the following things that affect the dose received : stack height, wind velocity, temperature, known health effects, concentrations at the fenceline, and the nature of the dose-response curve.

Perhaps the most important thing to remember is that because safety is a relative term, community members must be involved in decisions about the levels of safety they would like. One important feature of Title III is that it provides people with initial information to allow them to participate in such decisions, especially through the LEPC.

One other way a local official can help people make a determination about safety or acceptable risk is by "answering" as a citizen rather than as an official, describing how he or she would act or is acting:

"I drink the water", or "I let my children play outside."

An answer such as this is more effective when it includes a recognition of people's feelings:

"I can see that you are very concerned about this. What are your concerns and questions?"

Other questions about Scenario 2

In addition to questions about risk and safety, the newspaper article about emissions data is likely to elicit questions about existing government programs and enforcement:

3) Why are the plants allowed to emit these substances?
4) Is this facility in compliance with state or federal laws.
5) Are there other facilities in the area that have not reported that are also emitting these substances?

To answer question 3, we need to know about the present system for regulating emissions. Answering questions 4 and 5 requires obtaining and analyzing new information.

Present System for Regulating Emissions

The Present System for Regulating Emissions

It is difficult to answer the question about why plants are allowed to emit hazardous substances because of the intricacies of the federal and state laws regulating toxic chemicals. Although the emissions of many chemicals are indirectly controlled by air, water, or land disposal regulations, few are subject directly to specific federal emission permits or standards. Most EPA regulations deal with ambient levels of chemicals (in other words, they specify acceptable concentrations in the community's air or drinking water — not the amounts of the chemicals that can be released from a particular facility).

Where EPA does have regulations based on emissions, they generally apply to classes of chemicals (volatile organic compounds and particulate matter in the case of air; total suspended solids and certain types of waste streams for water). And in the handful of cases where EPA has established emission permits or standards for specific chemicals, they apply only to certain industries — not to all companies emitting those chemicals. For example, EPA has established a national air emission standard, or NESHAP, for benzene; but it applies only to certain industries and to certain processes within those industries. Therefore, to determine whether a particular company is complying with the benzene standard, you would need to know first, if the company is among the industries subject to the standard; second, which of its processes are regulated; and third, what percentage of the reported releases are emitted from those processes.

Citizens may ask whether all the emissions have been reported. The answer is no. Some facilities are not covered by the requirements of Title III; others may not know that they need to report; and still others may have decided not to do so.

Additionally, not all substances are covered - only those on the Section 313 list (see Appendix 5.) In short, the data provided by Title III, although better than anything we have had before, are still very limited. However, this question offers a good reason to discuss the opportunities for citizens to become involved in Title III activities.

Enforcement and Citizen Involvement Under Title III

Title III provides penalties for not submitting reports of routine releases. Facilities that do not submit may be sued by citizens and fined by EPA. In the many states that have passed their own right to know and chemical reporting laws, state agencies may also be able to obtain penalties for non-reporting. It may be difficult for states to determine that a facility has not reported, however. Local residents often have access to information that regulatory agencies do not have, so citizens may be able to help enforcement officials identify facilities that have failed to report.

Citizens who suspect that a facility is not reporting all or any of its emissions might begin by obtaining the chemical inventory lists available under Title III sections 311 and 312, and comparing those lists with the lists of chemicals reported as emissions on the section 313 report. Just because a chemical appears on the inventory does not mean it is emitted, so citizens will have to work with industry, local officials, and experts to determine whether it is likely that a substance is being emitted.

It is also important to recognize that the first emissions reports were due on July 1, 1988. Not every facility that should have reported even knew of its responsibility. Local officials and citizens can help identify facilities that are covered by the law and encourage them to report and notify state and EPA officials.

One answer to question 3—**"Why are the plants allowed to emit these substances?"** is

"Not all emissions of toxic substances are harmful. Usually environmental or human health problems arise when the substance is present at more than a particular concentration. Government regulations are formulated to keep the concentrations at levels that evidence suggests are consistent with environmental and human well-being. If regulations made all emissions illegal, little manufacturing could take place. If new information becomes available that suggests that the existing standard is wrong or that some substance for which there is no standard should have one, regulatory agencies try to write new standards. Under Title III, citizens and regulatory

agencies are learning about emissions they may not have known about before. This will provide a better basis for appropriate policy responses. Because the information is also available to citizens, they have an opportunity to participate in policymaking concerning emissions to a greater extent than before. One way they can participate is by becoming active in the Local Emergency Planning Committee."

To answer question 4—**Is a particular facility in compliance with state and federal laws?** will require review of reports filed by the facility with EPA or the appropriate state agency. Local officials can provide citizens with telephone numbers where they can obtain answers.

The answer to question 5—**"Are there other facilities in the area that have not reported that are also emitting these substances?"**— is largely procedural, although it should have some substantive information if available:

"Probably. The Local Emergency Planning Committee, interested citizens, and government agencies can use other information provided under Title III and other laws to try to identify facilities that may be emitting substances. Industry associations are also trying to get word out to their members about the obligation to report. Citizens who live near manufacturing facilities can certainly check with EPA or the [appropriate state agency that receives reports under section 313] to see whether neighboring facilities have reported. If not, they may talk to the facility manager to find out why. Remember, section 313 covers only some chemicals, so many facilities may have emissions they do not need to report. Also, facilities need not report if they use chemicals in amounts below specified quantities. Among the kinds of facilities that emit this chemical but are not included in the Title III requirement are ____. Because there are many such facilities in our community, there may be some cause for concern."

6) What other sources might lead to my being exposed to these chemicals?

The answer to this question is related to the answer to question 5, but can be based more closely on the data available under sections 312 and 313. The chemical inventories submitted to the LEPC under section 312 tell what chemicals are stored in the community, thereby providing some indication of the range of possible exposures. More important, the emissions data provided under section 313 provide some basic information about which chemicals are disposed to which medium. If aggregated for the whole community, these data can suggest

the routes by which people might be exposed to particular chemicals. The newspaper article in which the emissions are reported for this scenario does not consider the medium to which the chemicals are emitted, but this information is readily available from the forms submitted to EPA and state agencies.

Because the answer to this question rests on considering data for all local facilities at the same time, officials may feel that they are unable to answer it—they lack the time to do the necessary calculations. In anticipation of such questions and needs, Congress required EPA to computerize the emissions data. The Toxic Release Inventory (TRI) database is available to the public at modest cost. It contains all the emissions reports and allows users to examine the data in a variety of ways, including adding up all emissions of a particular chemical to a particular medium in a city or county. Appendix 2 provides information on how to get access to the TRI database. SERCs also have access to a similar database maintained at EPA, and may be able to provide some data to questioners.

Summary of Scenario 2: Routine Emissions

Citizen concerns about the routine emissions reported under Title III section 313 and described in the newspaper article cover a broad range of complex issues. Officials without specific expertise in these areas should not attempt to explain the details, instead referring questioners to appropriate expert sources. On the other hand, they should anticipate questions and prepare replies, since citizens may become angry if constantly told, "I cannot answer that. Please call so-and-so." But don't make up an answer when you don't know.

Among the strategies for responding to questions about long-term health effects where there is uncertainty about whether the particular chemical causes a health effect and/or about whether the emissions in question are related to particular citizens' health problems are the following:

1. Risks or risk levels should be compared at two different times, compared against a government standard, or compared with different estimates of the same risk. Note that comparisons with government standards, which are set using a combination of political and scientific criteria, may be misleading—it is not true that everything less than the standard is "safe" while everything over it is "unsafe." Different risks, especially risks with different characteristics, should not be compared. (See above, page 8. For more on risk comparison, see Covello, Sandman, and Slovic, "Risk Communication, Risk Statistics, and Risk Comparisons.")

2. Questions of "safety" are difficult to answer, especially on the basis of section 313 emissions data alone. Different people assess safety differently. However, statements describing how you would or are behaving in the same circumstances in combination with a description of the risk provide listeners with a basis for their own comparisons. People should have an opportunity to participate in determining whether existing levels of safety are sufficient.

3. Concern about risks may really reflect concerns about power or other political issues. Try to ascertain people's real concerns and answer those. Many concerns are really about whether procedures are fair and allow for adequate participation. Use the Local Emergency Planning Committee (LEPC) as a forum for all parties to work together.

4. Where possible, indicate ways people can control risks. They may be able to take some personal preventive action such as drinking bottled water and using pesticides more carefully around the home, or they may be able to join the LEPC or other community groups to act collectively against a risk.

5. Help people understand why the substance is present in the community in the first place. Familiar risks seem less worrisome than unfamiliar ones. Long chemical names are usually unfamiliar. Explaining what familiar items the chemical is used to manufacture may help people balance the risks and benefits.

Storing Large Quantities

About six weeks after publication of the article on emissions data, the following article appears in the local newspaper.

Ourcity Daily News

100 of 366 Extremely Hazardous Substances Present in Ourcity

Possibility of Serious Accidents Great
Emergency planning based on reports, but
only 70 reports filed: How many are missing?

More than 100 of the 366 chemicals the federal government calls "extremely hazardous" are found in our community in amounts greater than 10,000 pounds. Some of the chemicals are so hazardous that just a few pounds released into the air could kill hundreds of people under the worst conditions.

Seventy different facilities in New County have reported that they store these chemicals. Thirty of the chemicals are stored or used in quantities greater than 100,000 pounds. Forty facilities reported using chlorine, the chemical that spilled three months ago in the North High basement causing the evacuation of 1100 students and teachers. The New County Local Emergency Planning Committee, established under a new federal law designed to prevent chemical accidents, is developing a list of facilities that need to increase safety measures based on the list.

Extremely hazardous substances are chemicals determined by the federal Environmental Protection Agency to have the potential for causing serious human harm. Facilities must report these and many other hazardous chemicals under the federal Emergency Planning and Community Right-to-Know Act. The reports are available at the Ourcity Emergency Department, 110 Main Street.

Reporters from this newspaper examined the inventories submitted by local facilities as part of a continuing investigation into hazardous chemicals present in Ourcity. We learned that:

- Seventy facilities have submitted inventories. The federal law covers all commercial facilities that store hazardous chemicals in amounts greater than 10,000 pounds. There are 400 members of the Ourcity Chamber of Commerce. Charles Smith, president of Ourcity Citizens Against Toxics, stated that it seems likely that not all the facilities have reported that should have.

• Forty facilities store substances in quantities greater than 100 thousand pounds, and some as much as 1 million pounds. If storage containers leak, large quantities of chemicals could leach into the air or groundwater. Accidents involving many people are possible, mostly from fire or explosion.

• Among the substances stored in large quantities are chlorine, which produces a highly irritating toxic gas,

• There are at least 50 substances being stored in underground storage tanks. According to a recent survey conducted by the State Environment Department, more than half the underground storage tanks in the state are improperly built and in imminent danger of leaking.

Industry spokesmen emphasized the care they use in storing and working with the hazardous chemicals. "We're closer to them than anyone else, so we have a strong incentive to be careful," said Tom Thomas of Generic Chemical. City and county emergency officials stated that the annual inspections of facilities storing hazardous chemicals convinced them that chemicals are properly stored. They are working with facilities to reduce the possibility of accidents further. They stated that the emergency response plan updated under the same federal law that requires submission of chemical inventories also ensures citizens' safety.

Neighbors of plants are not so sure. "About once a month I hear the sirens over there," says Sharon Shivers, who lives in the Northridge neighborhood near the Generic plant. "I think their storage is faulty but they don't want us to know."

Citizens' Questions

After reading this article, citizens might ask the following questions:

1) Are the hazardous materials used by nearby facilities stored properly? What is the chance of leaks developing?

2) How likely are stored materials to be involved in an accident?

3) If they are released, what kinds of health or other hazards do they present?

4) Can we reduce the amounts of these materials that are stored in order to reduce risk?

5) What about the danger from chemicals stored by facilities that didn't have to report because they had less than 10,000 pounds?

Answers to these questions require some understanding of the process by which we plan for hazardous materials accidents and how we assess potential risks posed by facilities that store and use hazardous materials. Some of the questions raise issues we have already considered—providing information about health effects and opportunities for citizens to participate in planning and risk reduction activities.

Planning for Hazardous Chemical Emergencies

Section 303 of Title III requires the Local Emergency Planning Committees (LEPCs) to formulate a plan for emergency response. In order to make a realistic plan, LEPCs must first learn where and what chemicals are stored. The chemical inventories submitted under sections 311 and 312 and the lists of extremely hazardous substances submitted under section 302 provide this information.

To plan for emergencies, LEPCs follow these steps:

1. Identify Hazards: using information provided by facilities, determine the ways in which they store and use hazardous chemicals.

2. Conduct a vulnerability analysis: using credible worst case assumptions, determine a vulnerability zone and identify special facilities within that zone such as nursing homes or schools or special problems such as a drinking water source.

3. Work with high-priority facilities to refine and re-evaluate the hazards identification and vulnerability analysis.

4. Complete a risk analysis: make a rough estimate of risks based on hazard identification and vulnerability analysis and likelihood of releases. Then, integrate this information into a community-wide emergency plan. (The components of a community-wide plan are described on page 12.)

Figure 2 shows a sample hazards analysis for an extremely hazardous chemical at one site. If such an analysis is conducted for all hazardous chemicals found in the community, it will

Figure 2

SAMPLE HAZARDS ANALYSIS FOR ONE EXTREMELY HAZARDOUS SUBSTANCE AT A HYPOTHETICAL SITE

(REPEAT THIS ANALYSIS FOR EACH EHS AND SITE IN THE COMMUNITY)

INITIAL SCREENING

1. HAZARDS IDENTIFICATION (Major Hazards)	
a. Chemical	Chlorine
b. Location	Water treatment plant
c. Quantity	800 lbs.
d. Properties	Poisonous; may be fatal if inhaled. Respiratory conditions aggravated by exposure. Contact may cause burns to skin and eyes. Corrosive. Effects may be delayed.
2. VULNERABILITY ANALYSIS	
a. Vulnerable zone	A spill of 800 lbs. of chlorine from a storage tank could result in an area of radius greater than 10 miles where chlorine gas may exceed the level of concern (LOC). This would be a credible worst case scenario.
b. Population within vulnerable zone	Approximately 600 residents of a nursing home; workers at a small factory; 29 workers at the water treatment plant; urban area-400 persons/sq. mile; total population in vulnerable zone is more than 125,000.
c. Essential services within zone	2 fire stations and 1 hospital
3. RISK ANALYSIS (Initial Evaluation of Reporting Facilities—Relative Hazards)	Relative to potential hazards of other reporting facilites—high

REEVALUATION(PLANNING)

1. HAZARDS IDENTIFICATION	
a. Chemical	Chlorine
b. Location	No change
c. Maximum quantity that could be released	500 lbs. (decrease)
d. Properties	No change
2. VULNERABILITY ANALYSIS	
a. Vulnerable Zone	Zone decreases (new radius - 1.0 miles) due to smaller quantity released and use of urban dispersion model.
b. Population within vulnerable zone	Decreases; total population in vulnerable zone is 1250
c. Essential services	None
3 RISK ANALYSIS	
a. Likelihood of hazard occurrence	Low-because chlorine is stored in an area with leak detection equipment in 24 hour service with alarms. Protective equipment is kept outside storage room.
b. Consequences if people are exposed	High levels of chlorine gas in the nursing home and factory could cause death and respiratory distress. Bed-ridden nursing home patients are especially susceptible. High severity of consequences. However, gas is unlikely to reach a nursing home under reevaluated release conditions.
c. Consequences for property	Possible superficial damage to facility equipment and structures from corrosive fumes (repairable).
d Consequences of environmental exposure	Possible destruction of surrounding fauna and flora.
e Summary: likelihood/severity of on site	Low/High. (The community would assess this on a site- and incident-specific basis.)

provide answers for many of the questions on page 34. For example, the answer to the question "How likely are stored materials to be involved in an accident" may be found under Part 3 (Risk Analysis) of the Reevaluation section, which assesses risk after a change in the amount of the chemical stored. There, the risk for accidents from chlorine is evaluated as being low because chlorine is stored in an area with leak detection equipment and alarms.

Information that the LEPC collects, even extra information such as a worst-case vulnerability analysis or transportation routes, is available to the public. If the LEPC has completed a plan using the steps outlined above, it should be able to assist in answering the question about proper storage.

It is difficult to estimate the chance of leaks or accidents. This question is answered by describing the planning process, which both encourages facilities to store their hazardous chemicals in the best way and sets up a plan for minimizing damage that might result if an accident does occur.

Again, in answering questions about accidents, it is important to remember the risk characteristics listed on page 8. People feel more confident when it seems that all likely causes of accidents have been considered and planned for, because the risks seem more controllable, better understood, and less likely to be catastrophic.

Facility owners and managers have the final say over reducing the amounts of stored hazardous chemicals. The LEPC can provide a forum in which citizens can voice concerns to industry representatives and work with them to get these amounts reduced. Many facilities are willing to do this after they see the results of a vulnerability analysis. They may find out that their inventory costs decrease as well by having less of each hazardous chemical on hand.

Information about the health effects of individual chemicals will also be available through the LEPC, health professionals in state and local health and environment departments, poison control centers, and academic institutions, or through the references listed in Appendices 2 and 4.

Summary

The kinds of questions that storage raises are hard to answer.

Because each facility and each community is different, the answers can only be obtained by working carefully through the specific data provided by local facilities. This is very time-consuming work. After the data are obtained, citizens will still have to work with experts to determine whether storage methods and quantities are appropriate and whether health effects are worrisome.

Rather than providing sample answers, as we did in the other scenarios, we can offer only general suggestions:

Officials can best answer most of these questions by
- —referring to the plan and the procedures that went into creating it, and
- —referring to the sources within government where citizens can work with government and industry.

Summary & Conclusion

The "Seven Cardinal Rules of Risk Communication, " written by Vincent Covello and Frederick Allen and available in an EPA pamphlet are reprinted here. They both summarize and add to the information presented in this manual.

1. Accept and Involve the Public as a Legitimate Partner

* Involve the community early.
* Involve all parties that have an interest or stake in the issue.
* Remember, you work for the public.

The goal of risk communication should be to produce an informed public that is involved, interested, reasonable, thoughtful, solution-oriented, and collaborative.

2. Plan Carefully and Evaluate Your Efforts

* Begin with clear, explicit objectives.
* Evaluate the information you have about risks and know its strengths and weaknesses.
* Identify and address the particular interests of different groups.
* Train your staff — including technical staff — in communication skills.
* Practice and test your messages.
* Evaluate your efforts and learn from your mistakes.

3. Listen to the Public's Specific Concerns

If you do not listen to people, you cannot expect them to listen to you. Communication is a two-way activity.

* Do not make assumptions about what people know, think, or want done. Take the time to find out what people are thinking.
* Let all parties with an interest in the issue be heard.
* Identify with your audience. Put yourself in their place and recognize their emotions.

People are often more concerned about trust, credibility, competence, control, voluntary fairness, caring and compassion than mortality statistics or quantitative risk assessment.

4. Be Honest, Frank and Open

* State your credentials; but do not ask or expect to be trusted.
* If you do not know the answer or are uncertain, say so. Get back to people with answers. Admit mistakes.
* Disclose risk information as soon as possible.
* Do not minimize or exaggerate the level of risk.
* Lean toward sharing more information, not less — or people may think you are hiding something.

Trust and credibility are difficult to obtain. Once lost they are almost impossible to regain completely.

5. Coordinate and Collaborate with Other Credible Sources

* Take time to coordinate with other organizations or groups.
* Devote effort and resources to the slow, hard work of building bridges with other organizations.
* Try to issue communications jointly with other credible sources.

Few things make risk communication more difficult than conflicts or public disagreements with other credible sources.

6. Meet the Needs of the Media

* Be open with and accessible to reporters; respect their deadlines.
* Provide risk information tailored to the needs of each type of media.
* Prepare in advance and provide background material on complex issues.
* Do not hesitate to follow up on stories with praise or criticism.
* Try to establish long-term relationships of trust with specific editors and reporters.

The media are frequently more interested in politics than in risk; more interested in simplicity than in complexity; more interested in danger than in safety.

7. Speak Clearly and with Compassion

Technical information and jargon are barriers to successful

communication with the public.

* Be sensitive to local norms, such as speech and dress.
* Use vivid, concrete images that communicate on a personal level. Use example and anecdotes that make technical risk data come alive.
* Use simple, non-technical language.
* Use risk comparisons to help put risks in perspective; but avoid comparisons that ignore distinctions that people consider important.
* Acknowledge and respond (both in words and with actions) to emotions that people express — anxiety, fear, outrage, helplessness.
* Always try to include a discussion of actions that are under way or that can be taken. Tell people what you cannot do. Promise only what you can do, and be sure to do what you promise.
* If people are sufficiently motivated, they are quite capable of understanding complex risk information, even if they may not agree with you.
* Regardless of how well you communicate risk information, some people will not be satisfied.

These rules seem to be only common sense. Yet it is surprising how often they are violated when communicating about risk. Following them does not guarantee effective risk communication. On the other hand, it is unlikely that you will communicate effectively without them. There is also an informal eighth rule, which underlies all the others:

Know what you are talking about.

Since no one person can be expected to know everything, we have tried to provide sources for additional information as well as sample answers to questions in which you refer citizens to these sources.

Talking to people about risk is difficult. Certain buzzwords or ideas such as "cancer" often set off reactions that may be too strong. Many familiar chemicals that people use every day may have more serious effects than some of the unfamiliar chemicals they will hear about under Title III. Public officials must try to help citizens keep these risks in perspective.

Opportunity for Citizen Involvement

One of the most important factors that affects people's perceptions of risk is whether they feel in control. That is why several of our suggestions for response to citizen questions, especially when the questions cannot be answered with unequivocal scientific information, is to offer people a means for participating in decisionmaking about chemicals in their communities. Local Emergency Planning Committees (LEPCs) offer, or should offer, a logical place for such participation. Because LEPCs include representatives from government, industry, and citizen groups, they offer a good setting for encouraging the different interests to work together.

Risk communicators should take every opportunity to suggest direct ways in which individuals can take control to reduce their exposures to hazardous chemicals, such as standing upwind while filling the gas tank of an automobile.

Perhaps the single most important factor in communicating risks is that the source be perceived as trustworthy and willing to listen as well as talk. Other kinds of communication also benefit from these characteristics. Public officials can improve their effectiveness in many areas by learning the lessons of risk communication: develop a relationship of trust with people before some particular incident (such as a chemical spill) occurs, and talk with, not to, citizens. Although time-consuming, this strategy will more than repay the costs when what would otherwise be a divisive community issue is settled through compromise and negotiation.

Plan of Action

We have covered the things you need to do to more effectively fulfill your role as a "risk communicator." How can you best use this information back on the job?

Unfortunately, there is no "formula" or "master plan" that will provide rote answers to every question you may ever face in risk communications. The following steps are suggested, however, as actions you can take starting today that will help prepare you for your responsibilities in this area:

1. Set a time by which you will have filled in all of the information on the "Risk Communication Resource Sheet" in the front of the manual. Some of the information you already have;

other information might take some "digging." This resource sheet will provide a quick reference to many of the contact people who are knowledgeable about emissions, releases, stored substances, etc. Update this resource sheet annually.

2. Obtain copies of this manual for persons involved in your emergency plan.

3. Initiate contact, if you have not already done so, with members of your Local Emergency Planning Committee, and learn more about their activities.

4. Keep this manual in an accessible place for periodic review and/or in case of emergencies.

Please let us know your successes in communicating about risk, and what works most effectively. Contact:

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APPENDIX 1

Glossary of Commonly Used Terms

Absorbed dose--The amount of a chemical that enters the body of an organism.

Acute--Sharp, severe; having a rapid onset, severe symptoms, and a relatively short duration.
Acute exposure: a single exposure of relatively short duration.
Acute toxicity: the development of adverse health effects soon after a single exposure to a substance.

Additive effect--Combined effect of two or more chemicals equal to the sum of their individual effects.

Ambient--Environmental or surrounding conditions.

Animal studies (sometimes called "laboratory studies")--Investigations using animals as surrogates for humans, on the expectation that results in animals are pertinent to humans.

ATSDR--Agency for Toxic Substances and Disease Registry, part of the U.S. Public Health Service, based in Atlanta, Georgia, 30333.

Carcinogen--A chemical that causes or induces cancer.

CAS registration number--A number assigned by the Chemical Abstracts Service to identify a chemical.

Chronic--Occurring over a long period of time, either continuously or intermittently.
Chronic effect--effects that last a long time even if caused by a single acute exposure. (See also delayed effect.)
Chronic exposure--long-term, low-level exposure to a to a chemical.

Concentration--the amount of the substance in a representative unit of the medium.

Delayed effect--an effect of exposure that does not occur for some time. Sometimes called a "chronic" effect.

Dose--The amount of the sbustance that actually enters the body.

Dose-response--A quantitative relationship between the dose of a chemical and an effect caused by the chemical.

Dose-response curve--graphical presentation of the relaionship between degree of exposure to a chemical (dose) and observed biological effect or response.

Emission or release--the amount of a substance released from a facility. Releases are usually classified as routine--small regularly-released amounts that are planned to be released as part of a manufacturing process--and accidental.

Endangerment assessment--a site-specific risk assessment of the actual or potential danger to human health or welfare and the environment from the release of hazardous substances or waste. The endangenment assessment document is prepared in support of enforcement actions under CERCLA or RCRA.

Environmental fate--The destiny of a chemical after release to the environment; involves considerations such as transport through air, soil, and water; bioconcentration; degradation.

EPCRA--The Emergency Response and Community Right-to-Know Act of 1986; same as SARA Title III.

Epidemiological studies--Investigation of factors contributing to disease or adverse health effects in human populations.

Exposure--The contact with a chemical or physical agent. This contact can occur through breathing, drinking, eating, and by direct skin contact.

Extrapolation--Estimation of unknown values by extending or projecting from known values.

Extremely hazardous substances--Chemicals that have the potential for causing death or irreversible toxicity after relatively short exposure to small amounts. (They are acutely toxic.) On the basis of toxicity, generally in air, EPA has identified the list of the chemicals in Appendix 5.

Latency--Time from the first exposure to a chemical until the appearance of an adverse health effect.

LC50--the concentration of a chemical in air or water that is expected to cause death in 50 percent of test animals living in that air or water.

LD50-The dose of a chemical by a specific exposure pathway (eating, breathing, injection, or absorbed by the skin) that is expected to cause death in 50 percent of the test animals so treated.

LEPC--Local Emergency Planning Committee. Local body established under Title III.

LOAEL--Lowest-Observed-Adverse-Effect Level; the lowest dose in an experiment that produced an observable adverse effect.

Laboratory studies--Studies of the effects of chemicals on animals or cells.
--In vitro studies--Studies of chemical effects conducted in tissues, cells or subcellular extracts from an organism (i.e., not in the living organism).
--In vivo studies--Studies of chemical effects conducted in intact living organisms.

Long-term exposure--This occurs when a substance is present in the environment around a person over a long period of time.

MSDS--Material Safety Data Sheet. A description of the chemical, physical, and health effects of a chemical along with methods for protection and emergency response written for workplace settings.

Materials balance--An accounting of the mass flow of a substance from sources of production, through distribution and use, to disposal or distribution, and including any releases to the environment.

Mutagen--An agent that causes a permanent genetic change in a cell other than that which occurs during normal genetic recombination.

NOAEL--No-Observed-Adverse-Effect Level; the highest dose in an experiment that did not produce an observable adverse effect.

NRC--National Response Center, 1-800-424-8802.

Pathogen--Any disease-causing agent, usually applied to living agents.

Permissible dose--The dose of a chemical that may be received by an individual *without* the expectation of a significantly harmful result.

RCRA--Resource Conservation and Recovery Act. Another federal statute concerning hazardous substances.

Release--see "Emission."

Reversible effect--An effect that is not permanent; an especially adverse effect that diminishes when exposure to a toxic chemical ceases.

Risk--The likelihood of injury, disease, or death.

Risk assessment-A qualitative or quantitative evaluation of the environmental and/or health risk resulting from exposure to a chemical or physical agent (pollutant); combines exposure assessment results with toxicity assessment results to estimate risk.

Risk estimate--A description of the probability that organisms exposed to a specified dose of chemical will develop an adverse response (e.g., cancer).

Risk factor--Characteristic (e.g., race, sex, age, obesity) or variable (such as smoking, occupational exposure level) associated with increased probability of an adverse health effect.

Route of exposure--the avenue by which a chemical comes into contact with an organism (e.g., inhalation, ingestion, dermal contact, injection).

SARA-Superfund Amendments and Reauthorization Act of 1986.

SERC--State Emergency Response Commission. Established under Title III.

Teratogenicity--The capacity of a physical or chemical agent to cause hereditary congenital malformations (birth defects) in offspring.

Threshold--The lowest dose of a chemical at which a specifed measurable effect is observed and below which it is not observed.

Title III--the common name for the Emergency Planning and Community Right to Know Act of 1986, which is Title III of the Superfund Amendments and Reauthorization Act.

Toxicity--The quality or degree of being poisonous or harmful to plant, animal, or human life.

TRI--Toxics (or Toxic Chemical) Release Inventory. The database containing annual toxic chemical release reports submitted by certain manufacturing facilities, specified in Section 313 of EPCRA. The TRI is available to the public in county libraries, through a national computerized database maintained by the National Library of Medicine, and through regional EPA offices. See Appendix 2 for more information.

3. About Specific Chemicals

Chemical Manufacturers Association. Chemical Referral Center. 1-800-262-8200.

CAMEO (Computer-Aided Management for Emergency Operations). (Software--contains descriptions, health effects information, and emergency response information for more than 2400 chemicals.)

Department of Transportation. Emergency Response Guidebook. Lists about 1,000 substances by name and DOT identification number, giving hazards and isolation distances. Available from Office of Hazardous Materials Transportation, DMH-50, RSPA, DOT, 400 7th Street, S.W., Washington, D.C. 20590.

Environmental Protection Agency. *Common Synonyms for Chemicals Listed under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986.* December 1988.

Illinois EPA. *Chemical Information Sheets.* Springfield, Ill, 1986, 1987.

Massachusetts Department of Environmental Quality Engineering. *Layperson's Guide to Reading MSDSs:* Boston, Mass.

Michigan Department of Natural Resources. *Chemical Summaries.* East Lansing, Michigan.

New Hampshire Department of Health and Human Services. *Health Information Summaries.* Concord, N.H.

New Jersey Department of Health. *Hazardous Substance Fact Sheets.* Trenton, N.J. (Distributed by EPA to SERCs.]

North Carolina Department of Natural Resources and Community Development: *Chemical Profiles of Toxic Air Pollutants.* Raleigh, N.C., 1986.

Virginia Department of Health. *Virginia Fact Sheets.* Richmond, Va.

U.S. Coast Guard, Chemical Hazards Response Information System 202-267-1577.

Washington Department of Social and Health Services. *Toxic Substances Fact Sheets.* Olympia, WA.

4. General Information about Health Effects

Agency for Toxic Substances and Disease Registry. *Case Studies in Environmental Medicine.*

Agency for Toxic Substances and Disease Registry. *Toxicological Profiles.* Profiles have been developed for the hazardous substances that pose a significant potential threat to human health and are common at Superfund sites. Each profile contains toxicological and health effects information for the substance. (Write for information on how to obtain the Profiles: ATSDR, E-28, Division of Toxicology, 1600 Clifton Road, N.E., Atlanta, Georgia 30333.)

Bell, Carolyn. *The Environment in Small Doses: A Layperson's Guide to Understanding Toxic Substances.* Memphis, Tenn.: Autumn Expressions, 1987.

Environmental Protection Agency. *Chemical Exposures: Effects on Health.* 1987. Available from the TSCA Assistance Office, TS-799 at EPA.

APPENDIX 2

References and Sources

1. Title III

Environmental Protection Agency. *It's Not Over in October: A Guide for Local Emergency Planning Committees.* September 1988, written by thirteen organizations, representing federal, industry and trade associations, public interest groups, and others.

Environmental Protection Agency. *Chemicals in Your Community.* September 1988.

Environmental Protection Agency. *Community Right-to-Know and Small Business.* September 1988.

Environmental Protection Agency. *Toxic Chemical Release Inventory: Risk Screening Guide.* July 1989.

Chemical Manufacturers Association. *Title III Community Awareness Workbook.*

Chemical Manufacturers Association. *Community Guide to Title III.*

Hadden, Susan G. *A Citizen's Right to Know: Risk Communication and Public Policy.* Boulder: Colo.: Westview Press, 1989.

National Wildlife Federation. *Reducing the Risk of Chemical Disaster: A Citizen's Guide to the Federal Emergency Planning and Community Right to Know Act.*

Working Group on Community Right to Know. *What is the Emergency Planning and Community Right to Know Act?*

2. About Risk Communication

American Chemical Society, Department of Governmental Relations and Science Policy. *A Handbook on Chemical Risk Communication: Preparing for Community Interest in Chemical Release Data.* Draft IV, 1 July 1988.

Covello, Vincent T., David B. McCallum and Maria Pavlova. *Effective Risk Communication: The Role and Responsiblity of Government and Nongpvernment Organizations.* Preccedings of the Workshop on the Role of Government in Health Risk Communication and Public Education. New York:Plenum Press, 1988.

Covello, Vincent, Peter Sandman, and Paul Slovic. *Risk Communication, Risk Statistics, and Risk Comparisons: A Manual for Plant Managers.* Washington, D.C.: Chemical Manufacturers Association, 1988.

Hance, Betty, Caron Chess and Peter Sandman. *Improving Dialog with Communities: A Risk Communication Manual for Government.* Trenton: New Jersey Department of Environmental Protection, 1988.

Krimsky, Sheldon, and Alonzo Plough. *Environmental Hazards: Communicating Risks as a Social Process.* Dover, Mass: Auburn House Publishing Co., 1988.

Sandman, Peter. *Explaining Environmental Risk.* Washington, D.C.: Environmental Protection Agency, April 1986.

U.S. EPA, Office of Toxic Substances. *Toxic and Hazardous Chemicals - Title III and Communities: An Outreach Manual for Community Groups.* Washington, D.C.: EPA. September, 1989.

Environmental Protection Agency. *Toxic Chemicals: What They Are, How They Affect You.* Chicago, IL: U.S. Environmental Protection Agency, no date.

Fischhoff, Baruch, Sarah Lichtenstein, Paul Slovic, Stephen L. Derby, and Ralph Keeney (1981). *Acceptable Risk.* Cambridge: Cambridge University Press.

Liroff, Richard A., *Toxics in the Air.* Washington, D.C.: The Conservation Foundation, 1987.

Marczewski, Alice E. and Michael Kamrin. *Toxicology for the Citizen,* 2nd ed. East Lansing, MI: Michigan State University, Center for Environmental Toxicology, 1987. (Write the Center for Environmental Toxicology, C231 Holden Hall, Michigan State University, East Lansing, Michigan, 48824.)

Moses, Susan . *Chemical Risk: A Primer.* Washington, D.C.: American Chemical Society, 1984. A pamphlet for nonscientists focuses on scientific issues involved in determining the health risks arising from exposure to chemicals and mentions public perceptions of risk.

National Cancer Institute. *Everything Doesn't Cause Cancer.* Bethesda, MD: National Cancer Institute, 1984.

Ottoboni, M. ALice. *The Dose Makes the Poison: A Plain-Language Guide to Toxicology.* Berkeley, CA: Vincente Books, 1984. A readable and concise introduction to risks from chemicals.

Sasnett, Sam K. *A Toxics Primer.* Washington, DC: League of Women Voters of the United States, no date.

Toxicology Data Network System (TOXNET), National Library of Medicine (NLM). Online computerized databases of toxicological information on specific chemicals. See Section 8 on databases for more information.

Wexler, Phillip. *Information Resources in Toxicology.* New York: Elsvier Science Publishing Co.,1987. Guide to literature, computer files, organizations, and activiites concerning toxicology.

5. Evaluation Methods for Use in Specific Communities

Brockbank, Brad, John Cohrsson, and Vincent T. Covello. A manual on risk assessment techniques for decisionmakers and citizens. Washington, D.C.: Council on Environmental Quality, 1988.

CAMEO (Computer-Aided Management for Emergency Operations). (software)

Chemical Manufacturers Association.*Chemicals in the Community: Methods to Evaluate Airborne Levels.* Washington, D.C.: CMA, 1988. Identifies methods used to evaluate emission leels of airborne chemicals in the community. Intended for health professionals who can judge the most appropriate approach and evaluate available data.

Environmental Protection Agency. *Guide to Exercises in Chemical Emergency Preparedness Programs.*

EPA, FEMA, and DOT. *Technical Guidance for Hazards Analysis.* December 1987.

National Response Team, *Criteria for Review of Hazardous Materials Emergency Plans.* (NRT 1-A) May, 1988

National Response Team. *Hazardous Materials Planning Guide.* (NRT-1). March 1987. Available by writing Hazmat Planning Guide, OS-120, EPA, 401 M Street, S.W., Washington, D.C. 20460.

Public Health Foundation, Environmental Health Program. *Resource Guide for Environmental Health Risk Assessment.* Washington, D.C.: PHF, 1986. Organizational contact and other resource information to assist professionals who are assessing risks from polluted environments.

Rall, David P. *Medicine for the Layman: Environment and Disease.* Bethesda, MD: National Institutes for Health, 1982.

Sherry, Susan. *High Tech and Toxics: A Guide for Local Communities.* Washington DC: Golden Empire Health Planning Center, 1985.

Working Group on Community Right to Know. *Hazard Assessments and Plume Mapping Documents for LEPCs.*

6. State and Local Level Contacts and Resources (also see Appendix 4.)

Public Health Foundation, Environmental Health Program. *Directory of State and Territorial Environmental Health Services.* Washington, D.C.: PHF, 1987. Updated annually and in possession of each state's health department.

7. Waste Reduction

Irwin, Frances H. and Edwin Clark. *America's Waste: Managing for Risk Reduction.* Washington DC: The Conservation Foundation, 1987.

Muir, Warren and Joanna Underwood. *Promoting Hazardous Waste Reduction: Six Steps States Can Take.* New York: INFORM, 1987.

Sarokin, David J., Warren Muir, Catherine G. Miller, and Sebastian R. Sperber, *Cutting Chemical Wastes: What 29 Organic Chemical Plants are Doing to Reduce Hazardous Wastes.* New York: INFORM, 1985.

8. Databases.

National Library of Medicine (NLM), 8600 Rockville Pike, Bethesda, MD. 20894. 1-800-638-8480 or 301-496-6193. Databases are available online through a personal computer and modem connection, or in a medical library.

TOXLINE. A collection of online bibliographic information convering the pharmacological, biochemical, physiological, and toxicological effects of drugs and hazardous chemicals. For information: MEDLARS Management Section at the NLM address given above.

Toxicology Data Network System (TOXNET). A computerized system of files oriented to toxicology and related areas. The files include the Hazardous Substances Data Bank (HSDB), the Registry of Toxic Effects of Chemical Substances (RTECS), and the Environmental Protection Agency's Toxic Chemical Release Inventory (TRI). For information, contact the NLM at the address given above.

CCINFOdisc. Canadian Centre for Occupational Health and Safety.

CCINFOdisc is a compact disk with several toxic substances databases, including the New Jersey Fact Sheets.

APPENDIX 3

Brief Description of Title III by Section

301 - establishes LEPCs and SERCs (State Emergency Response Commissions).

302 - requires facilities to notify the LEPC and SERC if they store more than the threshold planning quantity of any of the extremely hazardous substances.

303 - requires the LEPC to formulate an emergency plan.

304 - requires facilities that release more than a reportable quantity to notify the LEPC and the SERC (and NRC for CERCLA hazardous substances).

311 - requires all facilities that store any hazardous substance in amounts greater than 10,000 pounds (for hazardous chemicals) or 500 pounds or the threshold planning quantity, whichever is less (for extremely hazardous substances), to submit a chemical list or Material Safety Data Sheet (MSDS) to the local fire department, LEPC, and SERC.

312 - requires an annual report including quantities of chemicals characterized by hazard (Tier 1 report) or as individual chemicals (Tier II report) to be submitted to the local fire department, LEPC, and SERC.

313 - An annual report by manufacturing facilities only of emissions to air, water, or ground of chemicals on a list of about 300.

321 - in general, Title III does not preempt state laws; states and localities may require supplementary information.

322 - allows manufacturers to claim chemical identity as trade secret if they meet several conditions.

323 - allows some doctors, nurses, and public health officials to obtain even information declared trade secret if they need it for treating patients and they promise not to disclose the information further.

326 - provides for lawsuits under certain circumstances by citizens against facilities that do not comply with the law and against agencies that do not fulfill their duties, and allows state and local governments to sue facilities.

The Emergency Planning and Community Right-To-Know Act of 1986

State Emergency Response Commission/Title III Contacts

November 1, 1989

Prepared by
The Emergency Planning and Community Right-To-Know Information Hotline
For more information call
1-800-535-0202
(or (202) 479-2449 in the Washington, DC metro area)

State Emergency Response Commission and State-Designated Agencies for the Emergency Planning and Community Right-to-Know Act

November 1, 1989

This list is the U.S. Environmental Protection Agency's listing of State Emergency Response Commissions and State designated agencies for the Emergency Planning and Community Right-to-Know Act. The EPA has verified each contact individually. All addresses listed under State Commissions receive the Section 302 emergency planning notification and the Section 304 emergency release notification unless otherwise specified. The State designated agencies receive the submissions for the sections listed in their headings. If one address is listed with no heading, the State commission receives all submissions for every section of the Act. If an additional address is listed under the heading "Mailing Address," this address is to be used for mailings to the State Commissions other than the P.O. boxes used for the form submissions.

ALABAMA

State Commission:
J. Danny Cooper, Co-Chair
Alabama Emergency Response Commission
Director, Alabama Emergency Management Agency
520 South Court Street
Montgomery, AL 36130
(205) 834-1375

Contact: Dave White

Section 311/312 Submissions:
Leigh Pegues, Co-Chair
Alabama Emergency Response Commission

Director, Alabama Department of Environmental Management
1751 Congressman W.L. Dickinson Drive
Montgomery, AL 36109
(205) 271-7700

Contact: L.G. Linn (205) 271-7700
E. John Williford (205) 271-7931

Section 313 Submissions:
E. John Williford, Chief of Operations
Alabama Emergency Response Commission
Alabama Department of Environmental Management
1751 Congressman W.L. Dickinson Drive
Montgomery, AL 36109
(205) 271-7700

Contact: L.G. Linn (205) 271-7700
E. John Williford (205) 271-7931

ALASKA

Dennis Kelso, Chair
Alaska State Emergency Response Commission
P.O. Box O
Juneau, AK 99811
(907) 465-2600

Mailing Address:
Linda VanHouten
Alaska State Emergency Response Commission
9000, Old Glacier Highway
P.O. Box 32420
Juneau, AK 99803

AMERICAN SAMOA

State Commission:
Maiava O. Hunkin
Program Coordinator for the Territorial Emergency Management Coordination Office
American Samoan Government
P.O. Box 1086
Pago Pago, American Samoa 96799
International Number (684) 633-2331

Section 311/312 & 313 Submissions:
Pati Faiai, Director
American Samoa EPA
Office of the Governor
Pago Pago, American Samoa 96799
International Number (684) 633-2304

ARIZONA

Carl F. Funk, Executive Director
Arizona Emergency Response Commission
Division of Emergency Services
5636 East McDowell Road
Phoenix, AZ 85008
(602) 231-6326

ARKANSAS

State Commission:
Randall Mathis, Director
Arkansas Department of Pollution Control and Ecology
P.O. Box 9583
8001 National Drive
Little Rock, AR 72219
(501) 562-7444

Contact: John Ward (501) 562-7444

Section 311/312 & 313 Submissions:
Becky Bryant
Depository of Documents
Arkansas Department of Labor
10421 West Markham
Little Rock, AR 72205

Contact: Becky Bryant (501) 682-4534

Mailing Address:
Arkansas Department of Pollution Control and Ecology
P.O. Box 9583
8001 National Drive
Little Rock, AR 72219
Attn: John Ward

CALIFORNIA

State Commission:
William Medigovich, Chair
California Emergency Planning and Response Commission
Director, Office of Emergency Services
2800 Meadowview Road
Sacramento, CA 95832
(916) 427-4287

Section 302, 304, 311/312 Submissions:
California Emergency Planning and Response Commission
Office of Emergency Services
Hazardous Materials Division
2800 Meadowview Road

Sacramento, CA 95832
(916) 427-4287

Contacts: Gary Burton
Michelle LaBella
Dave Zocchetti

Section 313 Submissions:
Chuck Shulock
Office of Environmental Affairs
P.O. Box 2815
Sacramento, CA 95812
Attn: Section 313 Reports
(916) 324-8124
(916) 322-7236 Completed *Form R* Information

COLORADO

State Commission:
David C. Shelton, Chair
Colorado Emergency Planning Commission
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220
(303) 331-4880

Emergency Release Notification:
(303) 331-4858
After Hours & Weekends (Emergencies Only):
(303) 377-6326

Section 302, 304, 311/312 & 313 Submissions:
Colorado Emergency Planning Commission
4210 East 11th Avenue
Denver, CO 80220

Contact: Judy Waddill (303) 331-4858

CONNECTICUT

Sue Vaughn, Title III Coordinator
State Emergency Response Commission
Department of Environmental Protection
State Office Building, Room 161
165 Capitol Avenue
Hartford, CT 06106
(203) 566-4856

DELAWARE

State Commission:
Patrick W. Murray, Chair
Delaware Commission on Hazardous Materials
Department of Public Safety
P.O. Box 818
Dover, DE 19903

Contact: George Frick (302) 736-3169

Section 302 Submissions:
Dominick Petrilli, Acting Director
Division of Emergency Planning and Operations
P.O. Box 527
Delaware City, DE 19706
(302) 834-4531

Section 304 Submissions:
Phillip Retallick, Director
Division of Air and Waste Management
Department of Natural Resources and Environmental Control
Richardson and Robbins Building
89 Kings Highway
P.O. Box 1401
Dover, DE 19903
(302) 736-4764

Section 311/312 Submissions:
Dr. Lawrence Krone, Chief
Bureau of Environmental Health
Jesse Cooper Building
Federal Street
P.O. Box 637
Dover, DE 19903
(302) 736-4731

Section 313 Submissions:
Robert French, Chief Program Administrator
Air Resource Section
Department of Natural Resources and Environmental Control
P.O. Box 1401
Dover, DE 19903
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DISTRICT OF COLUMBIA

Joseph P. Yeldell, Chair
State Emergency Response Commission for Title III
in the District of Columbia
Office of Emergency Preparedness
2000 14th Street, NW
Frank Reeves Center for Municipal Affairs
Washington, DC 20009
(202) 727-6161

Contact: Pamela Thurber, Environmental Planning Specialist

FLORIDA

Mr. Thomas G. Pelham, Chair
Florida Emergency Response Commission
Secretary, Florida Department of Community Affairs
2740 Centerview Drive
Tallahassee, FL 32399-2149
(904) 488-1472
In FL: 800-635-7179

Contact: Eve Rainey

GEORGIA

State **Commission:**
Mr. J. Leonard Ledbetter, Chair
Georgia Emergency Response Commission
Commissioner, Georgia Department of Natural Resources
205 Butler Street, SE
Floyd Towers East, 11th floor
Atlanta, GA 30334
(404) 656-4713

Section 302, 304, 311/312 & 313 Submissions:
Jimmy Kirkland
Georgia Emergency Response Commission
205 Butler Street, SE
Floyd Tower East
11th Floor, Suite 1166
Atlanta, GA 30334
(404) 656-6905
Emergency Release Number (800) 241-4113

GUAM

State **Commission & Section 311/312 Submissions:**
Dr. George Boughton, Chair
Guam State Emergency Response Commission
Civil Defense
Guam Emergency Services Office
Government of Guam
P.O. Box 2877
Aguana, Guam 96910
(671) 472-7230
FTS 550-7230

Section 313 Submissions:
Roland Solidio
Guam EPA
P.O. Box 2999
Aguana, Guam 96910
(671) 646-8863

HAWAII

State **Commission and Section 311/312 Submissions:**
Bruce S. Anderson, Ph.D., Vice-Chair
Hawaii State Emergency Response Commission
Hawaii Department of Health
P.O. Box 3378
Honolulu, HI 96801
(808) 548-2076
(808) 548-5832

Contact: Samir Araman (808) 543-8249
Mark Ingoglia (808) 543-8276

Section 313 Submissions:
John C. Lewin, M.D., Chair
Hawaii State Emergency Response Commission
Hawaii State Department of Health
P.O. Box 3378
Honolulu, HI 96801-9904
(808) 548-6505

IDAHO

State Commission:
Idaho Emergency Response Commission
State House
Boise, ID 83720
(208) 334-5888

Section 311/312 & 313 Submissions:
Idaho Emergency Response Commission
State House
Boise, ID 83720
Attn: Jenny Records

Contact: Jenny Records (208) 334-5888

ILLINOIS

State Commission and Section 311/312 Submissions:
Oran Robinson
Illinois Emergency Response Commission
Illinois Emergency Services & Disaster Agency
Attn: Hazmat Section
110 East Adams Street
Springfield, IL 62706
(217)782-4694

Section 313 Submissions:
Joe Goodner
Emergency Planning Unit
Illinois EPA
P.O. Box 19276
2200 Churchill Road
Springfield, IL 62794-9276
(217) 782-3637

INDIANA

Skip Powers, Director
Indiana Emergency Response Commission
5500 West Bradbury Avenue
Indianapolis, IN 46241
(317) 243-5176

IOWA

State Commission & Section 302 Submissions:
Ellen Gordon, Chair
Iowa Disaster Services
Hoover Building, Level A
Room 29
Des Moines, IA 50319
(515) 281-3231

Section 304 Submissions:
Department of Natural Resources
Division of Environmental Protection
Emergency Response Section
Wallace Building, 5th Floor
Des Moines, IA 50319
(515) 281-8694

Contact: Ron Kozel

Section 311/312 Submissions:
Iowa Emergency Response Commission
Division of Labor
1000 East Grand Avenue
Des Moines, IA 50319
(515) 281-6175

Contact: Don Peddy

Section 313 Submissions:
Department of Natural Resources
Records Department
900 East Grand Avenue
Des Moines, IA 50319
(515) 281-8852

Contact: Pete Hamlin

KANSAS

State Commission:
Karl Birns, Staff Director
Kansas Emergency Response Commission
and
Community Right-To-Know Program
Mills Building, 5th Floor
109 S.W. 9th Street
Topeka, KS 66612
(913) 296-1690

Section 302 & 304 Submissions:
Karl Birns
Kansas Department of Health and Environment
Right-to-Know Program
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(913) 296-1690
Emergency Release Number Only (24 hrs):
(913) 296-3176

Section 311/312 & 313 Submissions:
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Kansas Department of Health and Environment
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Topeka, KS 66612
(913) 296-1690

Contact: Karl Birns

KENTUCKY

State Commission & Section 311/312 Submissions:
Colonel James H. "Mike" Molloy, Chair
Kentucky Emergency Response Commission
Kentucky Disaster and Emergency Services
Boone National Guard Center
Frankfort, KY 40601-6168
(502) 564-8660
(502) 564-8682

Contact: Mike Molloy or Craig Martin

Section 313 Submissions:
Valerie Hudson
Kentucky Department of Environmental Protection
18 Reilly Road
Frankfort, KY 40601
(502) 564-2150

Mailing Address:
Lucille Orlando
SARA Title III
Kentucky Department of Environmental Protection
Kentucky Disaster and Emergency Services
Boone National Guard Center
Frankfort, KY 60601-6161

LOUISIANA

State Commission & Section 311/312 Submissions:
Sergeant Ronnie Mayeaux
Louisiana Emergency Response Commission
Office of State Police
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Baton Rouge, LA 70896
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Department of Environmental Quality
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333 Laurel Street
Baton Rouge, LA 70804-4066
(504) 342-8617

MAINE

David D. Brown, Chair
State Emergency Response Commission
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Augusta, ME 04333
(207) 289-4080
(800)452-8735 in ME

Contact: Tammy Gould

MARYLAND

State Commission:
June L. Swem
Governor's Emergency Management Agency
c/o Maryland Emergency Management Agency
2 Sudbrook Lane, East
Pikesville, MD 21208
(301) 486-4422

Section 302, 304, 311/312 & 313 Submissions:
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State Emergency Response Commission
Maryland Department of the Environment
Toxics Information Center
2500 Broening Highway
Baltimore, MD 21224
(301) 631-3800

MASSACHUSETTS

Arnold Sapenter
c/o Title Three Emergency Response Commission
Department of Environmental Quality Engineering
One Winter Street, 10th floor
Boston, MA 02108
(617) 292-5993
For LEPC Information: Jack Callahan (508) 820-2060

MICHIGAN

Title III Coordinator
Michigan Department of Natural Resources
Environmental Response Division
Title III Notification
P.O. Box 30028
Lansing, MI 48909
(517) 373-8481

MINNESOTA

Lee Tischler, Director
290 Bigelow Building
450 North Syndicate
St. Paul, MN 55155
(612) 643-3000

MISSISSIPPI

J.E. Maher, Chair
Mississippi Emergency Response Commission
Mississippi Emergency Management Agency
P.O. Box 4501
Fondren Station
Jackson, MS 39296-4501
(601) 960-9973

Contact: Bill Austin

MISSOURI

Dean Martin, Coordinator
Missouri Emergency Response Commission
Missouri Department of Natural Resources
P.O. Box 3133
Jefferson City, MO 65102
(314) 751-7929

Mailing Address:
Dean Martin
Missouri Emergency Response Commission
Missouri Department of Natural Resources
2010 Missouri Boulevard
Jefferson City, MO 65109

MONTANA

Tom Ellerhoff, Co-Chair
Montana Emergency Response Commission
Environmental Sciences Division
Department of Health & Environmental Sciences
Cogswell Building A-107
Helena, MT 59620
(406) 444-6911
Contact: Guy Youngblood

NEBRASKA

Clark Smith, Coordinator
Nebraska Emergency Response Commission
Nebraska Department of Environmental Control
P.O. Box 98922
State House Station
Lincoln, NE 68509-8922
(402) 471-2186
Emergency Number (After-hours): (402) 471-4545

NEVADA

State Commission and Section 311/312 Submissions:
Joe Quinn
Nevada Division of Emergency Management
2525 South Carson Street
Carson City, NV 89710
(702) 885-4240
Emergency Release Number (After Hours & Weekends): (702) 885-5300

Section 313 Submission:
Bob King
Division of Emergency Management
2525 South Carson Street
Carson City, NV 89710
(702) 885-4240

NEW HAMPSHIRE

Gerorge L. Iverson, Director
State Emergency Management Agency
Title III Program
State Office Park South
107 Pleasant Street
Concord, NH 03301
(603) 271-2231

Contact: Leland Kimball

NEW JERSEY

State Commission:
Tony McMahon, Director
New Jersey Emergency Response Commission
SARA Title III Project
Department of Environmental Protection
Division of Environmental Quality
CN-405
Attn: 304 Notification
Trenton, NJ 08625
(609) 292-6714
Emergency Number: (609) 292-7172

Section 302, 311/312 Submissions
New Jersey Emergency Response Commission
SARA Title III Project
Department of Environmental Protection
Division of Environmental Quality
CN-405
Trenton, NJ 08625
(609) 292-6714

Section 304 Submissions:
New Jersey Emergency Response Commission
SARA Title III Project
Department of Environmental Protection
Division of Environmental Quality
CN-027
Trenton, NJ 08625
(609) 292-6714

Section 313 Submissions:
New Jersey Emergency Response Commission
SARA Title III Section 313
Department of Environmental Protection
Division of Environmental Quality
Bureau of Hazardous Substances Information
CN-405
Trenton, NJ 08625
(609) 292-6714

NEW MEXICO

Samuel Larcombe
New Mexico Emergency Response Commission
New Mexico Department of Public Safety
P.O. Box 1628
Santa Fe, NM 87504-1628
(505) 827-9222

NEW YORK

State Commission:
Anthony Germano, Deputy Director
State Emergency Management Office
Building 22
State Campus
Albany, NY 12226
(518) 457-9996

Section 302, 304, 311/312 & 313 Submissions:
New York Emergency Response Commission
New York State Department of Environmental Conservation
Bureau of Spill Response
50 Wolf Road/Room 326
Albany, NY 12233-3510
(518) 457-4107

Contact: William Miner

NORTH CAROLINA

State Commission:
Joseph Myers, Chair
North Carolina Emergency Response Commission
116 West Jones Street
Raleigh, NC 27603-1335
(919) 733-3867

Section 302, 304, 311/312 & 313 Submissions:
North Carolina Emergency Response Commission
North Carolina Division of Emergency Management
116 West Jones Street
Raleigh, NC 27603-1335
(919) 733-3867
(800) 451-1403 (In NC General Information Only)

Contacts: Vance Kee (919) 733-3844
Emily Kilpatrick (919) 733-3865

NORTH DAKOTA

State Commission:
Ronald Affeldt, Chair
North Dakota Emergency Response Commission
Division of Emergency Management
P.O. Box 5511
Bismark, ND 58502-5511
(701) 224-2111

Section 302, 311/312 & 313 Submissions:
SARA Title III Coordinator
North Dakota State Department of Health and Consolidated Laboratories
1200 Missouri Avenue
P.O. Box 5520
Bismarck, ND 58502-5520
(701) 224-2374

Contact: Charles Rydell

COMMONWEALTH of NORTHERN MARIANA ISLANDS

State Commission and Section 311/312 Submissions:
Felix A. Sasamoto, Civil Defense Coordinator
Office of the Governor
Capitol Hill
Commonwealth of Northern Mariana Islands
Saipan, CNMI 96950
International Number (670) 322-9529

Section 313 Submissions:
Russell Meecham, III
Division of Environmental Quality
P.O. Box 1304
Saipan, CNMI 96950
(670) 234-6984

OHIO

State Commission and Section 311/312 Submissions:
Ken Schultz, Coordinator
Ohio Emergency Response Commission
Ohio Environmental Protection Agency
Office of Emergency Response
P.O. Box 1049
Columbus, OH 43266-0149
(614) 644-2260

Section 313 Submissions:
Cindy Sferra-DeWulf
Division of Air Pollution Control
1800 Watermark Drive
Columbus, OH 43215
(614) 644-2266

OKLAHOMA

Emergency Response Commission
Office of Civil Defense
P.O. Box 53365
Oklahoma City, OK 73152
(405) 521-2481

Contact: Aileen Ginther

OREGON

Ralph M. Rodia
Oregon Emergency Response Commission
c/o State Fire Marshall
3000 Market Street Plaza
Suite 534
Salem, OR 97310
(503) 378-2885

PENNSYLVANIA

State Commission:
Richard Rodney
Pennsylvania Emergency Response Commission
SARA Title III Officer
PEMA Response and Recovery
P.O. Box 3321
Harrisburg, PA 17105
(717) 783-8150
Emergency Release Number — 24 hours (717) 783-8150

Section 311/312 Submissions:
Pennsylvania Emergency Response Commission
c/o Bureau of Right-to-Know
Rm 1503
Labor and Industry Building
7th & Forrester Streets
Harrisburg, PA 17120
(717) 783-2071

Section 313 Submissions:
James Tinney
Bureau of Right -To- Know
Room 1503
Labor and Industry Building
7th & Forrester Streets
Harrisburg, PA 17120
(717) 783-2071

PUERTO RICO

State Commission and Section 311/312 Submissions:
Mr. Santos Rohena, Chair
Puerto Rico Emergency Response Commission
Environmental Quality Board
P.O. Box 11488
Sernades Juncos Station
Santurce, PR 00910
(809) 722-1175
(809) 722-2173

Section 313 Submissions:
SERC Commissioner
Title III-SARA Section 313
Puerto Rico Environmental Quality Board
P.O. Box 11488
Santurce, PR 00910
(809) 722-0077

RHODE ISLAND

State Commission:
Charles Givens, Acting Executive Director
Rhode Island Emergency Response Commission
State House Room 27
Providence, RI 02903
(401) 277-3039
Emergency Release Number (401) 274-7745

Contact: John Aucott

Section 311/312 Submissions:
Anthony Diccio
Rhode Island Department of Labor
Division of Occupational Safety
220 Elmwood Avenue
Providence, RI 02907
(401) 457-1847

Section 313 Submissions:
Department of Environmental Management
Division of Air and Hazardous Materials
291 Promenade Street
Providence, RI 02908
Attn: Toxic Release Inventory
(401) 277-2808

Contact: Martha Mulcahey

SOUTH CAROLINA

State Commission and Section 302 Submissions:
Stan M. McKinney, Chair
South Carolina Emergency Response Commission
Division of Public Safety Programs
Office of the Governor
1205 Pendleton Street
Columbia, SC 29201
(803) 734-0425

Section 304 & 311/312 Submissions:
South Carolina Emergency Response Commission
Division of Public Safety Programs
Office of the Governor
1205 Pendleton Street
Columbia, SC 29201
Attn: Purdy McLeod
(803) 734-0425

Section 313 Submissions:
Ron Kinney
Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201
(803) 734-5200

SOUTH DAKOTA

State Commission and Section 311/312 Submissions:
Clark Haberman, Director
South Dakota Emergency Response Commission
Department of Water and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181
(605) 773-3151

Section 313 Submissions:
Lee Ann Smith, Director
South Dakota Emergency Response Commission
Department of Water and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181
(605) 773-3153

TENNESSEE

Mr. Lacy Suiter, Chair
Tennessee Emergency Response Commission
Director, Tennessee Emergency Management Agency
3041 Sidco Drive
Nashville, TN 37204
(615) 252-3300
(800) 258-3300 (out of TN)
(800) 262-3300 (in TN)

Contact: Lacy Suiter or Tom Durham

TEXAS

State Commission:
David Haun, Coordinator
Texas Emergency Response Commission
Division of Emergency Management
P.O. Box 4087
Austin, TX 78773-0001
(512) 465-2138

Section 302, 311/312 Submissions:
Dr. William Elliot
Texas Department of Health
Division of Occupational Safety and Health
1100 West 49th Street
Austin, TX 78756
(512) 458-7410

Section 313 Submissions:
David Barker, Supervisor
Emergency Response Unit
Texas Water Commission
P.O. Box 13087-Capitol Station
Austin, TX 78711-3087
(512) 463-8527

Contact: Priscilla Seymour

UTAH

State Commission:
Lorayne Frank, Director
Comprehensive Emergency Management
P.O. Box 58136
1543 Sunnyside Avenue
Salt Lake City, UT 84158-0136
(801) 584-8370

Section 311/312 & 313 Submissions:
Neil Taylor
Utah Hazardous Chemical Emergency Response Commission
Utah Division of Environmental Health
288 North 1460 West
P.O. Box 16690
Salt Lake City, UT 84116-0690
(801) 538-6121

VERMONT

State Commission:
Jeanne VanVlandren, Chair
Vermont Emergency Response Commission
Department of Labor and Industry
5 Court Drive
Montpelier, VT 05602
(802) 828-2286

Contact: Robert McLeod (802) 828-2765

Section 311/312 & 313 Submissions:
Dr. Jan Carney, Commissioner
Department of Health
60 Main Street
P.O. Box 70
Burlington, VT 05402
(802) 863-7281

VIRGIN ISLANDS

Allan D. Smith, Commissioner
Department of Planning and Natural Resources

U.S. Virgin Islands Emergency Response Commission
Title III
Suite 231
Nisky Center
Charlotte Amalie
St. Thomas, VI 00802
(809) 774-3320 Extension 169 or 170

Contact: Gregory Rhymer

VIRGINIA

Wayne Halbleib, Director
Virginia Emergency Response Council
Department of Waste Management
James Monroe Building
14th Floor
101 North 14th Street
Richmond, VA 23219
(804) 225-2513

WASHINGTON

State Commision:
Chuck Clarke
Washington Emergency Response Commission
Department of Community Development
Mail Stop GH-51
9th and Columbia Building
Olympia, WA 98504
(206) 753-5625

Contact: Bill Bennett (206) 459-9191
(800) 633-7585 (in WA)

Section 311/312 and 313 Submission:
John Ridgway, Chair
Washington State Department of Ecology
Hazardous Substance Information Office
MS-PV/11
Olympia, WA 98504
(206) 438-7252

WEST VIRGINIA

Carl L. Bradford, Director
West Virginia Emergency Response Commission
West Virginia Office of Emergency Services
State Capital Building 1, Rm. EB-80
Charleston, WV 25305
(304) 348-5380
Emergency Release Number (304) 348-5380

Contact: Bill Jopling

WISCONSIN

State Commission:
Richard I. Braund, Director
Wisconsin Emergency Response Commission
Division of Emergency Government
4802 Sheboygan Avenue
P.O. Box 7865
Madison, WI 53707
(608) 266-3232

Section 313 Submissions:
Department of Natural Resources
P.O. Box 7921
Madison, WI 53707
Attn: Russ Dumst
(608) 266-9255

WYOMING

Ed Usui, Executive Secretary
Wyoming Emergency Response Commission
Wyoming Emergency Management Agency
Comprehensive Emergency Management
P.O. Box 1709
Cheyenne, WY 82003
(307) 777-7566
Contact: Brooke Hefner

Mailing Address:
Ed Usui
Wyoming Emergency Response Commission
Wyoming Emergency Management Agency
Comprehensive Emergency Management
5500 Bishop Boulevard
Cheyenne, WY 82009

APPENDIX 5

Extremely Hazardous Substances

CAS Number	Chemical Name
[illegible]	ACETONE CYANOHYDRIN
[illegible]	ACETONE THIOSEMICARBAZIDE
[illegible]	ACROLEIN
[illegible]	ACRYLAMIDE
[illegible]	ACRYLONITRILE
[illegible]	ACRYLYL CHLORIDE
[illegible]	ADIPONITRILE
[illegible]	ALDICARB
[illegible]	ALDRIN
[illegible]	ALLYL ALCOHOL
[illegible]	ALLYLAMINE
21359738	ALUMINUM PHOSPHIDE
[illegible]	AMINOPTERIN
[illegible]	AMITON
[illegible]	AMITON OXALATE
[illegible]	AMMONIA
[illegible]	AMPHETAMINE
[illegible]	ANILINE
[illegible]	ANILINE, 2,4,6-TRIMETHYL-
[illegible]	ANTIMONY PENTAFLUORIDE
[illegible]	ANTIMYCIN A
[illegible]	ANTU
[illegible]	ARSENIC PENTOXIDE
[illegible]	ARSENOUS OXIDE
[illegible]	ARSENOUS TRICHLORIDE
[illegible]	ARSINE
[illegible]	AZINPHOS-ETHYL
[illegible]	AZINPHOS-METHYL
[illegible]	BENZAL CHLORIDE
[illegible]	BENZENAMINE, 3-(TRIFLUOROMETHYL)-
[illegible]	BENZENE, 1-(CHLOROMETHYL)-4-NITRO-
[illegible]	BENZENEARSONIC ACID
[illegible]	BENZIMIDAZOLE,4,5-DICHLORO-2-(TRIFLUOROMETHYL)-
[illegible]	BENZOTRICHLORIDE
[illegible]	BENZYL CHLORIDE
[illegible]	BENZYL CYANIDE
[illegible]	BICYGLO[2.2.1]HEPTANE-2-CARBONITRILE, 5-CHLORO-6-((((METHYLAMINO)CARBONYL)OXY)IM
[illegible]	BIS(CHLOROMETHYL) KETONE
[illegible]	BITOSCANATE
[illegible]	BORON TRICHLORIDE
[illegible]	BORON TRIFLUORIDE
[illegible]	BORON TRIFLUORIDE COMPOUND WITH METHYL ETHER (1:1)
[illegible]	BROMADIOLONE
[illegible]	BROMINE
[illegible]	CADMIUM OXIDE
[illegible]	CADMIUM STEARATE
[illegible]	CALCIUM ARSENATE
[illegible]	CAMPHECHLOR
[illegible]	CANTHARIDIN
[illegible]	CARBACHOL CHLORIDE
[illegible]	CARBAMIC ACID, METHYL-, O-(((2,4-DIMETHYL-1, 3-DITHIOLAN-2-METHYL)METHYLENE)AMINO)-
[illegible]	CARBOFURAN
[illegible]	CARBON DISULFIDE
[illegible]	CARBOPHENOTHION
[illegible]	CHLORDANE
[illegible]	CHLORFENVINFOS
[illegible]	CHLORINE
24934916	CHLORMEPHOS
999815	CHLORMEQUAT CHLORIDE
79118	CHLOROACETIC ACID
107073	CHLOROETHANOL
627112	CHLOROETHYL CHLOROFORMATE
67663	CHLOROFORM
542881	CHLOROMETHYL ETHER
107302	CHLOROMETHYL METHYL ETHER
3691358	CHLOROPHACINONE
1982474	CHLOROXURON
21923239	CHLORTHIOPHOS
10025737	CHROMIC CHLORIDE
10210681	COBALT CARBONYL
62207765	COBALT, ((2,2'-(1,2-ETHANEDIYLBIS (NITRILOMETHYLIDYNE))BIS(6-FLUOROPHENOLATO))
64868	COLCHICINE
56724	COUMAPHOS
5836293	COUMATETRALYL
95487	CRESOL, o-
535897	CRIMIDINE
4170303	CROTONALDEHYDE
123739	CROTONALDEHYDE, (E)-
506683	CYANOGEN BROMIDE
506785	CYANOGEN IODIDE
2636262	CYANOPHOS
675149	CYANURIC FLUORIDE
66819	CYCLOHEXIMIDE
108918	CYCLOHEXYLAMINE
17702419	DECABORANE(14)
8065483	DEMETON
919868	DEMETON-S-METHYL
10311849	DIALIFOR
19287457	DIBORANE
111444	DICHLOROETHYL ETHER
149746	DICHLOROMETHYLPHENYLSILANE
62737	DICHLORVOS
141662	DICROTOPHOS
1464535	DIEPOXYBUTANE
814493	DIETHYL CHLOROPHOSPHATE
1642542	DIETHYLCARBAMAZINE CITRATE
71636	DIGITOXIN
2238075	DIGLYCIDYL ETHER
20830755	DIGOXIN
115264	DIMEFOX
60515	DIMETHOATE
2524030	DIMETHYL PHOSPHOROCHLORIDOTHIOATE
77781	DIMETHYL SULFATE
75183	DIMETHYL SULFIDE
99989	DIMETHYL-p-PHENYLENEDIAMINE
75785	DIMETHYLDICHLOROSILANE
57147	DIMETHYLHYDRAZINE
644644	DIMETILAN
534521	DINITROCRESOL
88857	DINOSEB
1420071	DINOTERB
78342	DIOXATHION
82666	DIPHACINONE
152169	DIPHOSPHORAMIDE, OCTAMETHYL-
298044	DISULFOTON
514738	DITHIAZANINE IODIDE
541537	DITHIOBIURET

CAS Number	Chemical Name
316427	EMETINE, DIHYDROCHLORIDE
115297	ENDOSULFAN
2778043	ENDOTHION
72208	ENDRIN
106898	EPICHLOROHYDRIN
2104645	EPN
50146	ERGOCALCIFEROL
379793	ERGOTAMINE TARTRATE
1622328	ETHANESULFONYL CHLORIDE, 2-CHLORO-10140871 ETHANOL, 1,2-DICHLORO-, ACETATE
563122	ETHION
13194484	ETHOPROPHOS
538078	ETHYLBIS(2-CHLOROETHYL)AMINE
371620	ETHYLENE FLUOROHYDRIN
75218	ETHYLENE OXIDE
107153	ETHYLENEDIAMINE
151564	ETHYLENEIMINE
542905	ETHYLTHIOCYANATE
22224926	FENAMIPHOS
122145	FENITROTHION
115902	FENSULFOTHION
4301502	FLUENETIL
7782414	FLUORINE
640197	FLUOROACETAMIDE
144490	FLUOROACETIC ACID
359068	FLUOROACETYL CHLORIDE
51218	FLUOROURACIL
944229	FONOFOS
50000	FORMALDEHYDE
107164	FORMALDEHYDE CYANOHYDRIN
23422539	FORMETANATE HYDROCHLORIDE
2540821	FORMOTHION
17702577	FORMPARANATE
21548323	FOSTHIETAN
3878191	FUBERIDAZOLE
110009	FURAN
13450903	GALLIUM TRICHLORIDE
77474	HEXACHLOROCYCLOPENTADIENE
4835114	HEXAMETHYLENEDIAMINE, N,N'-DIBUTYL-
302012	HYDRAZINE
74908	HYDROCYANIC ACID
7647010	HYDROGEN CHLORIDE (Gas Only)
7664393	HYDROGEN FLUORIDE
7722841	HYDROGEN PEROXIDE (Conc.> 52%)
7783075	HYDROGEN SELENIDE
7783064	HYDROGEN SULFIDE
123319	HYDROQUINONE
13463406	IRON, PENTACARBONYL-
297789	ISOBENZAN
78820	ISOBUTYRONITRILE
102363	ISOCYANIC ACID, 3,4-DICHLOROPHENYL ESTER
465736	ISODRIN
55914	ISOFLUORPHATE
4098719	ISOPHORONE DIISOCYANATE
108236	SOPROPYL CHLOROFORMATE
625558	ISOPROPYL FORMATE
119380	ISOPROPYLMETHYLPYRAZOLYL DIMETHYLCARBAMATE
78977	LACTONITRILE
21609905	LEPTOPHOS
541253	LEWISITE
58899	LINDANE
7580678	LITHIUM HYDRIDE
109773	MALONONITRILE
12108133	MANGANESE, TRICARBONYL METHYLCYCLOPENTADIENYL
51752	MECHLORETHAMINE
950107	MEPHOSFOLAN
1600277	MERCURIC ACETATE
7487947	MERCURIC CHLORIDE
21908532	MERCURIC OXIDE
10476956	METHACROLEIN DIACETATE
760930	METHACRYLIC ANHYDRIDE
126987	METHACRYLONITRILE
920467	METHACRYLOYL CHLORIDE
30674807	METHACRYLOYLOXYETHYL ISOCYANATE
10265926	METHAMIDOPHOS
558258	METHANESULFONYL FLUORIDE
950378	METHIDATHION
2032657	METHIOCARB
16752775	METHOMYL
51382	METHOXYETHYLMERCURIC ACETATE
80637	METHYL 2-CHLOROACRYLATE
74839	METHYL BROMIDE
79221	METHYL CHLOROFORMATE
624920	METHYL DISULFIDE
60344	METHYL HYDRAZINE
624839	METHYL ISOCYANATE
556616	METHYL ISOTHIOCYANATE
74931	METHYL MERCAPTAN
3735237	METHYL PHENKAPTON
676971	METHYL PHOSPHONIC DICHLORIDE
556649	METHYL THIOCYANATE
78944	METHYL VINYL KETONE
502396	METHYLMERCURIC DICYANAMIDE
75796	METHYLTRICHLOROSILANE
1129415	METOLCARB
7786347	MEVINPHOS
315184	MEXACARBATE
50077	MITOMYCIN C
6923224	MONOCROTOPHOS
2763964	MUSCIMOL
505602	MUSTARD GAS
13463393	NICKEL CARBONYL
54115	NICOTINE
65305	NICOTINE SULFATE
7697372	NITRIC ACID
10102439	NITRIC OXIDE
98953	NITROBENZENE
1122607	NITROCYCLOHEXANE
10102440	NITROGEN DIOXIDE
62759	NITROSODIMETHYLAMINE
991424	NORBORMIDE
	0 ORGANORHODIUM COMPLEX(PMN-82-147)
630604	OUABAIN
23135220	OXAMYL
78717	OXETANE, 3,3-BIS(CHLOROMETHYL)-
2497076	OXYDISULFOTON
10028156	OZONE
1910425	PARAQUAT
2074502	PARAQUAT METHOSULFATE
56382	PARATHION
298000	PARATHION-METHYL
12002038	PARIS GREEN
19624227	PENTABORANE
2570265	PENTADECYLAMINE
79210	PERACETIC ACID
594423	PERCHLOROMETHYLMERCAPTAN
108952	PHENOL
97187	PHENOL, 2,2'-THIOBIS(4,6-DICHLORO-

CAS Number	Chemical Name
4418660	PHENOL, 2,2'-THIOBIS[4-CHLORO-6-METHYL-
64006	PHENOL, 3-(1-METHYLETHYL)-, METHYLCARBAMATE
58366	PHENOXARSINE, 10,10'-OXYDI-
696286	PHENYL DICHLOROARSINE
59881	PHENYLHYDRAZINE HYDROCHLORIDE
62384	PHENYLMERCURY ACETATE
2097190	PHENYLSILATRANE
103855	PHENYLTHIOUREA
298022	PHORATE
4104147	PHOSACETIM
947024	PHOSFOLAN
75445	PHOSGENE
732116	PHOSMET
13171216	PHOSPHAMIDON
7803512	PHOSPHINE
2703131	PHOSPHONOTHIOIC ACID, METHYL-, O-ETHYL O-(4-(METHYLTHIO)PHENYL) ESTER
50782699	PHOSPHONOTHIOIC ACID, METHYL-, S-(2-(BIS(1-METHYLETHYL)AMINO)ETHYL) O-ETHYL ESTER
2665307	PHOSPHONOTHIOIC ACID, METHYL-,O-(4-NITROPHENYL) O-PHENYL ESTER
3254635	PHOSPHORIC ACID, DIMETHYL 4-(METHYLTHIO) PHENYL ESTER
2587908	PHOSPHOROTHIOIC ACID,0,0-DIMETHYL-5-(2-(METHYLTHIO)ETHYL)ESTER
7723140	PHOSPHORUS
10025873	PHOSPHORUS OXYCHLORIDE
10026138	PHOSPHORUS PENTACHLORIDE
1314563	PHOSPHORUS PENTOXIDE
7719122	PHOSPHORUS TRICHLORIDE
57476	PHYSOSTIGMINE
57647	PHYSOSTIGMINE, SALICYLATE (1:1)
124878	PICROTOXIN
110894	PIPERIDINE
8291130	PIPROTAL
23505411	PIRIMIFOS-ETHYL
10124502	POTASSIUM ARSENITE
151508	POTASSIUM CYANIDE
506616	POTASSIUM SILVER CYANIDE
1031370	PROMECARB
106967	PROPARGYL BROMIDE
57578	PROPIOLACTONE, beta-
107120	PROPIONITRILE
542767	PROPIONITRILE, 3-CHLORO-
7699	PROPIOPHENONE,4-AMINO
109615	PROPYL CHLOROFORMATE
75569	PROPYLENE OXIDE
75558	PROPYLENEIMINE
2275185	PROTHOATE
129000	PYRENE
140761	PYRIDINE, 2-METHYL-5-VINYL-
504245	PYRIDINE, 4-AMINO-
1124330	PYRIDINE, 4-NITRO-, 1-OXIDE
53558251	PYRIMINIL
4167181	SALCOMINE
107448	SARIN
7783008	SELENIOUS ACID
7791333	SELENIUM OXYCHLORIDE
4170--	SEMICARBAZIDE HYDROCHLORIDE
7---2-	SILANE, (4-AMINOBUTYL)DIETHOXYMETHYL-
7631892	SODIUM ARSENATE
7784465	SODIUM ARSENITE

CAS Number	Chemical Name
26628228	SODIUM AZIDE (Na(N3))
124652	SODIUM CACODYLATE
143339	SODIUM CYANIDE (Na(CN))
62748	SODIUM FLUOROACETATE
131522	SODIUM PENTACHLOROPHENATE
13410010	SODIUM SELENATE
10102188	SODIUM SELENITE
10102202	SODIUM TELLURITE
900958	STANNANE,ACETOXYTRIPHENYL-
57249	STRYCHNINE
60413	STRYCHNINE, SULFATE
3689245	SULFOTEP
3569571	SULFOXIDE, 3-CHLOROPROPYL OCTYL
7446095	SULFUR DIOXIDE
7783600	SULFUR TETRAFLUORIDE
7446119	SULFUR TRIOXIDE
7664939	SULFURIC ACID
77816	TABUN
13494809	TELLURIUM
7783804	TELLURIUM HEXAFLUORIDE
107493	TEPP
13071799	TERBUFOS
78002	TETRAETHYL LEAD
597648	TETRAETHYLTIN
75741	TETRAMETHYL LEAD
509148	TETRANITROMETHANE
10031591	THALLIUM SULFATE
6533739	THALLOUS CARBONATE
7791120	THALLOUS CHLORIDE
2757188	THALLOUS MALONATE
7446186	THALLOUS SULFATE
2231574	THIOCARBAZIDE
39196184	THIOFANOX
297972	THIONAZIN
108985	THIOPHENOL
79196	THIOSEMICARBAZIDE
5344821	THIOUREA, (2-CHLOROPHENYL)-
614788	THIOUREA, (2-METHYLPHENYL)-
7550450	TITANIUM TETRACHLORIDE
584849	TOLUENE 2,4-DIISOCYANATE
91087	TOLUENE 2,6-DIISOCYANATE
110576	TRANS-1,4-DICHLOROBUTENE
1031476	TRIAMIPHOS
24017478	TRIAZOFOS
1558254	TRICHLORO(CHLOROMETHYL)SILANE
27137855	TRICHLORO(DICHLOROPHENYL)SILANE
76028	TRICHLOROACETYL CHLORIDE
115219	TRICHLOROETHYLSILANE
327980	TRICHLORONATE
98135	TRICHLOROPHENYLSILANE
998301	TRIETHOXYSILANE
75774	TRIMETHYLCHLOROSILANE
824113	TRIMETHYLOLPROPANE PHOSPHITE
1066451	TRIMETHYLTIN CHLORIDE
639587	TRIPHENYLTIN CHLORIDE
555771	TRIS(2-CHLOROETHYL)AMINE
2001958	VALINOMYCIN
1314621	VANADIUM PENTOXIDE
108054	VINYL ACETATE MONOMER
81812	WARFARIN
129066	WARFARIN SODIUM
28347139	XYLYLENE DICHLORIDE
1314847	ZINC PHOSPHIDE
58270089	ZINC, DICHLORO(4,4-DIMETHYL-5((((METHYLAMINO) CARBONYL)OXY)IMINO)PENTANENITRILE)

APPENDIX 6

SECTION 313 TOXIC CHEMICAL LIST FOR REPORTING YEAR 1988
Toxics Release Inventory Chemicals
(including Chemical Categories)
Alphabetical Chemical List

CAS Number	Chemical Name	De Minimus Concentration (percent)
75-07-0	Acetaldehyde	0.1
60-35-5	Acetamide	0.1
67-64-1	Acetone	1.0
75-05-8	Acetonitrile	1.0
53-96-3	2-Acetylaminofluorene	0.1
107-02-8	Acrolein	1.0
79-06-1	Acrylamide	0.1
79-10-7	Acrylic acid	1.0
107-13-1	Acrylonitrile	0.1
309-00-2	Aldrin {1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a, 5,8,8a-hexahydro-(1.alpha., 4.alpha.,4a.beta.,5.alpha., 8.alpha.,8a.beta.)-}	1.0
107-05-1	Allyl chloride	1.0
7429-90-5	Aluminum (fume or dust)	1.0
1344-28-1	Aluminum oxide	1.0
117-79-3	2-Aminoanthraquinone	0.1
60-09-3	4-Aminoazobenzene	0.1
92-67-1	4-Aminobiphenyl	0.1
82-28-0	1-Amino-2-methylanthraquinone	0.1
7664-41-7	Ammonia	1.0
6484-52-2	Ammonium nitrate (solution)	1.0
7783-20-2	Ammonium sulfate (solution)	1.0
62-53-3	Aniline	1.0
90-04-0	o-Anisidine	0.1
104-94-9	p-Anisidine	1.0
134-29-2	o-Anisidine hydrochloride	0.1
120-12-7	Anthracene	1.0
7440-36-0	Antimony	1.0
7440-38-2	Arsenic	0.1
1332-21-4	Asbestos (friable)	0.1
7440-39-3	Barium	1.0
98-87-3	Benzal chloride	1.0
55-21-0	Benzamide	1.0
71-43-2	Benzene	0.1
92-87-5	Benzidine	0.1
98-07-7	Benzoic trichloride (Benzotrichloride)	0.1
98-88-4	Benzoyl chloride	1.0
94-36-0	Benzoyl peroxide	1.0
100-44-7	Benzyl chloride	1.0
7440-41-7	Beryllium	0.1
92-52-4	Biphenyl	1.0
111-44-4	Bis(2-chloroethyl) ether	1.0
542-88-1	Bis(chloromethyl) ether	0.1
108-60-1	Bis(2-chloro-1-methylethyl) ether	1.0
103-23-1	Bis(2-ethylhexyl) adipate	0.1
75-25-2	Bromoform	1.0

	{Tribromomethane}	
74-83-9	Bromomethane	1.0
	{Methyl bromide}	
106-99-0	1,3-Butadiene	0.1
141-32-2	Butyl acrylate	1.0
71-36-3	n-Butyl alcohol	1.0
78-92-2	sec-Butyl alcohol	1.0
75-65-0	tert-Butyl alcohol	1.0
85-68-7	Butyl benzyl phthalate	1.0
106-88-7	1,2-Butylene oxide	1.0
123-72-8	Butyraldehyde	1.0
4680-78-8	C.I. Acid Green 3*	1.0
569-64-2	C.I. Basic Green 4*	1.0
989-38-8	C.I. Basic Red 1*	0.1
1937-37-7	C.I. Direct Black 38*	0.1
2602-46-2	C.I. Direct Blue 6*	0.1
16071-86-6	C.I. Direct Brown 95*	0.1
2832-40-8	C.I. Disperse Yellow 3*	1.0
3761-53-3	C.I. Food Red 5*	0.1
81-88-9	C.I. Food Red 15*	0.1
3118-97-6	C.I. Solvent Orange 7*	1.0
97-56-3	C.I. Solvent Yellow 3*	0.1
842-07-9	C.I. Solvent Yellow 14*	0.1
492-80-8	C.I. Solvent Yellow 34*	0.1
	Auramine)	
128-66-5	C.I. Vat Yellow 4*	1.0
7440-43-9	Cadmium	0.1
156-62-7	Calcium cyanamide	1.0
133-06-2	Captan	1.0
	{1H-Isoindole-1,3(2H)-dione, 3a,4,7,7a-tetrahydro-2-[(trichloromethyl)thio]-}	
63-25-2	Carbaryl	1.0
	{1-Naphthalenol, methylcarbamate}	
75-15-0	Carbon disulfide	1.0
56-23-5	Carbon tetrachloride	0.1
463-58-1	Carbonyl sulfide	1.0
120-80-9	Catechol	1.0
133-90-4	Chloramben	1.0
	{Benzoic acid, 3-amino-2,5-dichloro-}	
57-74-9	Chlordane	1.0
	{4,7-Methanoindan, 1,2,4,5,6,7, 8,8-octachloro-2,3,3a,4,7,7a-hexahydro-}	
7782-50-5	Chlorine	1.0
10049-04-4	Chlorine dioxide	1.0
79-11-8	Chloroacetic acid	1.0
532-27-4	2-Chloroacetophenone	1.0
108-90-7	Chlorobenzene	1.0
510-15-6	Chlorobenzilate	1.0
	{Benzeneacetic acid,4-chloro-.alpha.-(4-chlorophenyl)-alpha.-hydroxy-,ethyl ester}	
75-00-3	Chloroethane	1.0
	{Ethyl chloride}	
67-66-3	Chloroform	0.1
74-87-3	Chloromethane	1.0
	{Methyl chloride}	
107-30-2	Chloromethyl methyl ether	0.1
126-99-8	Chloroprene	1.0
1897-45-6	Chlorothalonil	1.0
	{1,3-Benzenedicarbonitrile; 2,4,5,6-tetrachloro-}	
7440-47-3	Chromium	0.1

7440-48-4	Cobalt	1.0
7440-50-8	Copper	1.0
120-71-8	p-Cresidine	0.1
1319-77-3	Cresol (mixed isomers)	1.0
108-39-4	m-Cresol	1.0
95-48-7	o-Cresol	1.0
106-44-5	p-Cresol	1.0
98-82-8	Cumene	1.0
80-15-9	Cumene hydroperoxide	1.0
135-20-6	Cupferron	0.1
	{Benzeneamine, N-hydroxy-N-nitroso, ammonium salt}	
110-82-7	Cyclohexane	1.0
94-75-7	2,4-D	1.0
	{Acetic acid, (2,4-dichlorophenoxy)-}	
1163-19-5	Decabromodiphenyl oxide	1.0
2303-16-4	Diallate	1.0
	{Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester}	
615-05-4	2,4-Diaminoanisole	0.1
39156-4	1-7 2,4-Diaminoanisole sulfate	0.1
101-80-4	4,4'-Diaminodiphenyl ether	0.1
25376-45-8	Diaminotoluene (mixed isomers)	0.1
95-80-7	2,4-Diaminotoluene	0.1
334-88-3	Diazomethane	1.0
132-64-9	Dibenzofuran	1.0
96-12-8	1,2-Dibromo-3-chloropropane	0.1
	{DBCP}	
106-93-4	1,2-Dibromoethane	0.1
	{Ethylene dibromide}	
84-74-2	Dibutyl phthalate	1.0
25321-22-6	Dichlorobenzene (mixed isomers)	0.1
95-50-1	1,2-Dichlorobenzene	1.0
541-73-1	1,3-Dichlorobenzene	1.0
106-46-7	1,4-Dichlorobenzene	0.1
91-94-1	3,3'-Dichlorobenzidine	0.1
75-27-4	Dichlorobromomethane	1.0
107-06-2	1,2-Dichloroethane	0.1
	{Ethylene dichloride}	
540-59-0	1,2-Dichloroethylene	1.0
75-09-2	Dichloromethane	0.1
	{Methylene chloride}	
120-83-2	2,4-Dichlorophenol	1.0
78-87-5	1,2-Dichloropropane	1.0
542-75-6	1,3-Dichloropropylene	0.1
62-73-7	Dichlorvos	1.0
	{Phosphoric acid, 2,2-dichloroethenyl dimethyl ester}	
115-32-2	Dicofol	1.0
	{Benzenemethanol, 4-chloro-alpha.-(4-chlorophenyl)-alpha.- (trichloromethyl)-}	
1464-53-5	Diepoxybutane	0.1
111-42-2	Diethanolamine	1.0
117-81-7	Di-(2-ethylhexyl) phthalate	0.1
	{DEHP}	
84-66-2	Diethyl phthalate	1.0
64-67-5	Diethyl sulfate	0.1
119-90-4	3,3'-Dimethoxybenzidine	0.1
60-11-7	4-Dimethylaminoazobenzene	0.1
119-93-7	3,3'-Dimethylbenzidine	0.1
	{o-Tolidine}	
79-44-7	Dimethylcarbamyl chloride	0.1

57-14-7	1,1-Dimethyl hydrazine	0.1
105-67-9	2,4-Dimethylphenol	1.0
131-11-3	Dimethyl phthalate	1.0
77-78-1	Dimethyl sulfate	0.1
534-52-1	4,6-Dinitro-o-cresol	1.0
51-28-5	2,4-Dinitrophenol	1.0
121-14-2	2,4-Dinitrotoluene	1.0
606-20-2	2,6-Dinitrotoluene	1.0
117-84-0	n-Dioctyl phthalate	1.0
123-91-1	1,4-Dioxane	0.1
122-66-7	1,2-Diphenylhydrazine {Hydrazobenzene}	0.1
106-89-8	Epichlorohydrin	0.1
110-80-5	2-Ethoxyethanol	1.0
140-88-5	Ethyl acrylate	0.1
100-41-4	Ethylbenzene	1.0
541-41-3	Ethyl chloroformate	1.0
74-85-1	Ethylene	1.0
107-21-1	Ethylene glycol	1.0
151-56-4	Ethyleneimine {Aziridine}	0.1
75-21-8	Ethylene oxide	0.1
96-45-7	Ethylene thiourea	0.1
2164-17-2	Fluometuron {Urea, N,N-dimethyl-N'-[3-(trifluoromethyl)phenyl]-}	1.0
50-00-0	Formaldehyde	0.1
76-13-1	Freon 113 {Ethane, 1,1,2-trichloro-1,2,2-trifluoro-}	1.0
76-44-8	Heptachlor {1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene}	1.0
118-74-1	Hexachlorobenzene	0.1
87-68-3	Hexachloro-1,3-butadiene	1.0
77-47-4	Hexachlorocyclopentadiene	1.0
67-72-1	Hexachloroethane	1.0
1335-87-1	Hexachloronaphthalene	1.0
680-31-9	Hexamethylphosphoramide	0.1
302-01-2	Hydrazine	0.1
10034-93-2	Hydrazine sulfate	0.1
7647-01-0	Hydrochloric acid	1.0
74-90-8	Hydrogen cyanide	1.0
7664-39-3	Hydrogen fluoride	1.0
123-31-9	Hydroquinone	1.0
78-84-2	Isobutyraldehyde	1.0
67-63-0	Isopropyl alcohol (manufacturing-strong acid process, no supplier notification)	0.1
80-05-7	4,4'-Isopropylidenediphenol	1.0
7439-92-1	Lead	0.1
58-89-9	Lindane {Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1.alpha.,2.alpha, 3.beta.,4.alpha., 5.alpha., 6.beta.)-}	0.1
108-31-6	Maleic anhydride	1.0
12427-38-2	Maneb {Carbamodithioic acid, 1,2-ethanediylbis-, manganese complex}	1.0
7439-96-5	Manganese	1.0
7439-97-6	Mercury	1.0
67-56-1	Methanol	1.0
72-43-5	Methoxychlor {Benzene, 1,1'-(2,2,2-trichloroethylidene)bis-4-methoxy-}	1.0

109-86-4	2-Methoxyethanol	1.0
96-33-3	Methyl acrylate	1.0
1634-04-4	Methyl tert-butyl ether	1.0
101-14-4	4,4'-Methylenebis(2-chloroaniline) {MBOCA}	0.1
101-61-1	4,4'-Methylenebis(N,N-dimethyl) benzenamine	0.1
101-68-8	Methylenebis (phenylisocyanate) {MBI}	1.0
74-95-3	Methylene bromide	1.0
101-77-9	4,4'-Methylenedianiline	0.1
78-93-3	Methyl ethyl ketone	1.0
60-34-4	Methyl hydrazine	1.0
74-88-4	Methyl iodide	0.1
108-10-1	Methyl isobutyl ketone	1.0
624-83-9	Methyl isocyanate	1.0
80-62-6	Methyl methacrylate	1.0
90-94-8	Michler's ketone	0.1
1313-27-5	Molybdenum trioxide	1.0
505-60-2	Mustard gas {Ethane, 1,1'-thiobis[2-chloro-}	0.1
91-20-3	Naphthalene	1.0
134-32-7	alpha-Naphthylamine	0.1
91-59-8	beta-Naphthylamine	0.1
7440-02-0	Nickel	0.1
7697-37-2	Nitric acid	1.0
139-13-9	Nitrilotriacetic acid	0.1
99-59-2	5-Nitro-o-anisidine	0.1
98-95-3	Nitrobenzene	1.0
92-93-3	4-Nitrobiphenyl	0.1
1836-75-5	Nitrofen {Benzene, 2,4-dichloro-1-(4-nitrophenoxy)-}	0.1
51-75-2	Nitrogen mustard {2-Chloro-N-(2-chloroethyl)-N-methylethanamine}	0.1
55-63-0	Nitroglycerin	1.0
88-75-5	2-Nitrophenol	1.0
100-02-7	4-Nitrophenol	1.0
79-46-9	2-Nitropropane	0.1
156-10-5	p-Nitrosodiphenylamine	0.1
121-69-7	N,N-Dimethylaniline	1.0
924-16-3	N-Nitrosodi-n-butylamine	0.1
55-18-5	N-Nitrosodiethylamine	0.1
62-75-9	N-Nitrosodimethylamine	0.1
86-30-6	N-Nitrosodiphenylamine	1.0
621-64-7	N-Nitrosodi-n-propylamine	0.1
4549-40-0	N-Nitrosomethylvinylamine	0.1
59-89-2	N-Nitrosomorpholine	0.1
759-73-9	N-Nitroso-N-ethylurea	0.1
684-93-5	N-Nitroso-N-methylurea	0.1
16543-55-8	N-Nitrosonornicotine	0.1
100-75-4	N-Nitrosopiperidine	0.1
2234-13-1	Octachloronaphthalene	1.0
20816-12-0	Osmium tetroxide	1.0
56-38-2	Parathion {Phosphorothioic acid, o, o-diethyl-o-(4-nitrophenyl) ester}	1.0
87-86-5	Pentachlorophenol {PCP}	1.0
79-21-0	Peracetic acid	1.0

108-95-2	Phenol	1.0
106-50-3	p-Phenylenediamine	1.0
90-43-7	2-Phenylphenol	1.0
75-44-5	Phosgene	1.0
7664-38-2	Phosphoric acid	1.0
7723-14-0	Phosphorus (yellow or white)	1.0
85-44-9	Phthalic anhydride	1.0
88-89-1	Picric acid	1.0
1336-36-3	Polychlorinated biphenyls {PCBs}	0.1
1120-71-4	Propane sultone	0.1
57-57-8	beta-Propiolactone	0.1
123-38-6	Propionaldehyde	1.0
114-26-1	Propoxur {Phenol, 2-(1-methylethoxy)-, methylcarbamate}	1.0
115-07-1	Propylene {Propene}	1.0
75-55-8	Propyleneimine	0.1
75-56-9	Propylene oxide	0.1
110-86-1	Pyridine	1.0
91-22-5	Quinoline	1.0
106-51-4	Quinone	1.0
82-68-8	Quintozene {Pentachloronitrobenzene}	1.0
81-07-2	Saccharin (manufacturing, no supplier notification) {1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide}	0.1
94-59-7	Safrole	0.1
7782-49-2	Selenium	1.0
7440-22-4	Silver	1.0
1310-73-2	Sodium hydroxide (solution)	1.0
7757-82-6	Sodium sulfate (solution)	1.0
100-42-5	Styrene	0.1
96-09-3	Styrene oxide	0.1
7664-93-9	Sulfuric acid	1.0
100-21-0	Terephthalic acid	1.0
79-34-5	1,1,2,2-Tetrachloroethane	0.1
127-18-4	Tetrachloroethylene {Perchloroethylene}	0.1
961-11-5	Tetrachlorvinphos {Phosphoric acid, 2-chloro-1- (2,3,5-trichlorophenyl) ethenyl dimethyl ester}	1.0
7440-28-0	Thallium	1.0
62-55-5	Thioacetamide	0.1
139-65-1	4,4'-Thiodianiline	0.1
62-56-6	Thiourea	0.1
1314-20-1	Thorium dioxide	1.0
7550-45-0	Titanium tetrachloride	1.0
108-88-3	Toluene	1.0
584-84-9	Toluene-2,4-diisocyanate	0.1
91-08-7	Toluene-2,6-diisocyanate	0.1
95-53-4	o-Toluidine	0.1
636-21-5	o-Toluidine hydrochloride	0.1
8001-35-2	Toxaphene	0.1
68-76-8	Triaziquone {2,5-Cyclohexadiene-1,4-dione, 2,3,5-tris(1-aziridinyl)-}	0.1
52-68-6	Trichlorfon {Phosphonic acid,(2,2,2-trichloro-1-hydroxyethyl)-,dimethyl ester}	1.0
120-82-1	1,2,4-Trichlorobenzene	1.0
71-55-6	1,1,1-Trichloroethane	1.0

	(Methyl chloroform)	
79-00-5	1,1,2-Trichloroethane	1.0
79-01-6	Trichloroethylene	1.0
95-95-4	2,4,5-Trichlorophenol	1.0
88-06-2	2,4,6-Trichlorophenol	0.1
1582-09-8	Trifluralin	1.0
	{Benzenamine, 2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)-}	
95-63-6	1,2,4-Trimethylbenzene	1.0
126-72-7	Tris(2,3-dibromopropyl phosphate)	0.1
51-79-6	Urethane	0.1
	(Ethyl carbamate)	
7440-62-2	Vanadium (fume or dust)	1.0
108-05-4	Vinyl acetate	1.0
593-60-2	Vinyl bromide	0.1
75-01-4	Vinyl chloride	0.1
75-35-4	Vinylidene chloride	1.0
1330-20-7	Xylene (mixed isomers)	1.0
108-38-3	m-Xylene	1.0
95-47-6	o-Xylene	1.0
106-42-3	p-Xylene	1.0
87-62-7	2,6-Xylidine	1.0
7440-66-6	Zinc (fume or dust)	1.0
12122-67-7	Zineb	1.0
	{Carbamodithioic acid, 1,2-ethanediylbis-, zinc complex}	

Reporting thresholds:

Calendar year 1988: 50,000 poinds for manufactured or processed substances; 10,000 pounds for otherwise used.
Calendar year 1989: 25,000 poinds for manufactured or processed substances; 10,000 pounds for otherwise used.

SECTION 313 CHEMICAL CATEGORIES

Section 313 requires emissions reporting on the chemical categories listed below, in addition to the specific chemicals listed above. The metal compounds listed below, unless otherwise specified, are defined as including any unique chemical substance that contains the named metal (i.e., antimony, copper, etc.) as part of that chemical's structure. For further definitions of the other compounds, consult EPA guidance documents.

Chemical categories are subject to the 1 percent *de minimis* concentration unless the substance involved meets the definition of an OSHA carcinogen.

Antimony Compounds
Arsenic Compounds
Barium Compounds
Beryllium Compounds
Cadmium Compounds
Chromium Compounds
Cobalt Compounds
Copper Compounds
Lead Compounds
Manganese Compounds
Mercury Compounds
Nickel Compounds
Selenium Compounds
Silver Compounds
Thallium Compounds
Zinc Compounds

Categories of chemicals with special conditions: see EPA guidance.
Chlorophenols
Cyanide Compounds
Glycol Ether
Polybrominated Biphenyls

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INTRODUCTION

When confronted with extraordinarily high levels of naturally occurring radon found in Colebrookdale Township, Pennsylvania (commonly referred to as Boyertown) and Clinton, New Jersey, government agencies faced the difficult task of both reassuring alarmed homeowners and alerting apathetic ones. By contrast, when the New Jersey Department of Environmental Protection sought to dispose of radium-contaminated soil in Vernon, New Jersey, the community responded with an enormous outcry, mobilizing thousands of citizens in protest.

The responses of these three communities raise important issues related to public perception of risk and agency communication efforts. The responsibility of reducing radon in homes, unlike many environmental hazards, falls largely to the individual rather than to government. Therefore, the effectiveness of government communication was particularly significant in Boyertown and Clinton, where radon levels put some homeowners at serious risk. Because the public response in Vernon was marked by anger that too often greets government actions, an understanding of those events may help agency officials avoid similar responses.

The goal of this study, funded by the United States Environmental Protection Agency's Office of Policy, Planning, and Evaluation, is to review the efforts of government officials to communicate with the three communities for lessons learned: what worked well, what might have been handled differently, and how agencies can communicate more effectively about risk, particularly radon risk.

METHODOLOGY

While empirical research has quantitatively examined public response to radon risk, this project has used a case study approach. It looks retrospectively at the three communities in order to grapple with communication issues that are difficult to track quantitatively, such as government interaction with communities, relationship to local officials, and development of trust.

The case study methodology is useful in studying risk communication because it underscores the complexity and richness of interactions which might otherwise be lost in more quantitative research. By pointing to risk communication successes and failures, case studies suggest to practitioners strategies to try and to avoid in their own communication efforts. Unlike quantitative research, however, case studies cannot accurately identify precise conditions under which various effects are

likely to happen. They can, however, offer hypotheses that may then be the subject of more rigorous quantitative research.

The discussion of Clinton and Boyertown distills the observations, judgments, and recommendations of those we interviewed in Boyertown and Clinton, including federal, state, and local officials; contractors; reporters; realtors; and citizen leaders. (For a list of interviewees, see Appendix A.)

For the most part, the methodology for the case study of these two towns was the same. In Clinton, however, there was no defined citizens group, and the owner of the "discovery" house was never identified. Moreover, few citizens were mentioned by name in the media, and local officials declined to reveal the names of townspeople in order to protect confidentiality. We felt that interviewing a non-representative sample of citizens (for example, the one or two who revealed their names to the press) would be more misleading than useful. Therefore, citizens were not interviewed in Clinton.

A separate section of this report analyzes the events surrounding the radon communication at Vernon, NJ in light of the recommendations drawn from the study of Clinton and Boyertown. We employed for this analysis a case study prepared by the Eagleton Institute of Politics and the political science department at Rutgers University.[1] We chose to use this case study as opposed to conducting our own research in Vernon because we felt the case study adequately covered the incidents at Vernon and we did not want to "reinvent the wheel," disturbing participants with another set of interviews. In addition, our thrust was applying the positive lessons learned in the other towns to a situation like Vernon's, and we felt that dwelling on the specifics of the case would be less useful.

While attempting to be useful to agency practitioners, this report is not derived from quantitative analysis and may not be entirely free of bias. We sought to reduce bias during the research for Clinton and Boyertown by using an identical interview protocol for the individuals in each group of participants (i.e., realtors, citizens, government officials, and contractors) and by interviewing similar participants in each community. The entire report was reviewed extensively by participants, academic experts, and practitioners in state agencies and EPA. In the case of Vernon, there may have been existing biases in the original report that affected our analysis of it.

BOYERTOWN, PENNSYLVANIA AND CLINTON, NEW JERSEY

SUMMARY OF EVENTS

Boyertown

In a story that is now almost legend, on December 13, 1984 Boyertown resident Stanley Watras set off radiation detectors as he entered Philadelphia Electric Company's (PECO) Limerick generating station, where he worked as a senior construction engineer. After sampling (in response to Watras' request) detected more than 2,000 pCi/l of radon in the home, Philadelphia Electric contacted officials at the Pennsylvania Department of Environmental Resources (PADER), who sampled at Watras' home on December 26. PADER's readings confirmed Philadelphia Electric's and on January 5, 1985 PADER officials hand-delivered a letter from the Secretary Nicholas DeBenedictus that recommended the family "vacate" their home.

During the following weeks PADER began sampling homes of Watras' neighbors, and by the middle of January publicly offered free testing to residents of the area. (This offer was subsequently extended to all Pennsylvania residents living on the Reading Prong, the geological formation which officials initially thought defined the geographical boundaries of the problem.) Several town meetings were conducted by officials of PADER and the Pennsylvania Department of Health, and PADER set up a field office in Gilbertsville, PA. In April 1985, Philadelphia Electric announced its intention to remediate the Watras home, and subsequently EPA remediated another 18 homes as part of a demonstration project. In addition, PADER contracted for comprehensive assessments of the radon problems and potential remediation strategies on another 25 homes. In April, residents Kay Jones and Kathy Varady formed Pennsylvanians Against Radon (now called People Against Radon), a group of homeowners who were frustrated by what they considered difficulty in getting information and the slow pace of remediation.

Clinton

New Jersey Department of Environmental Protection (NJDEP) officials were familiar with PADER's efforts, and had already launched a radon program. In March 1986 they received a call from a resident of Clinton who had obtained a reading of 1000 pCi/l through private testing. The following day NJDEP confirmed the reading and began surveying Clinton Knolls, the development where the house was located, for gamma radiation (a potential indicator of a radon problem inside homes). Finding gamma levels that were significantly higher than normal background levels, NJDEP began sampling homes in concentric circles away from the initial "discovery" house and found elevated levels in many of

the homes in Clinton Knolls.

NJDEP and the New Jersey Department of Health (NJDOH) conducted a public meeting with Clinton residents and held a number of "by invitation only" meetings to update homeowners of Clinton Knolls while protecting confidentiality. In addition, NJDEP staffed a part-time office in the municipal building. In May EPA selected ten homes for remediation as part of a demonstration project and committed to providing diagnostic work-ups for 20 more. By November environmental officials announced that homes in the demonstration project had been remediated successfully to levels within the federal guidelines.

PUBLIC REACTION

Clinton

Gauging public reaction several years after an event is problematic, at best. The impressions of those involved become more susceptible to distortion as time passes. However, the observations of those we interviewed in Clinton are remarkably similar, suggesting a fair degree of consensus about their perception of public reaction in this small town of 1,900 residents. Clinton, which is located in a relatively rural section of Hunterdon County, includes a growing population of business and professional people, particularly in the Clinton Knolls section, a development with a population of about 500.

The discovery of high levels of radon in Clinton Knolls was met with concern. Gerald Nicholls of NJDEP characterized public response as "initially strong, fearful" based on the concern shown at the first public meeting that attracted more than 300 people. He noted, however, that although people were deeply concerned, no one "got overly emotional." In the words of Judy Klotz of New Jersey Department of Health (NJDOH), "People were sober, but not hysterical; they were willing to listen."

Terry Brennan of Camroden Associates, who worked in the houses that were part of EPA's research project, noted that "The people in Clinton didn't respond the way almost everyone else has responded. It was a group of pretty different people getting together in a difficult situation and working together." Brennan also noted that he found more concerns from people about their health than he usually encounters, due, he suspects, to the extremely high radon levels found in Clinton Knolls.

Clinton real estate agents reported different impressions about the initial reaction ranging from fear to apathy but observed a more tempered response after a relatively short time. Mickey Greco of Schlott Realtors said that clients' initial reaction ("I don't want to know about it.... I'm going to hope

nobody asks") changed as more houses were discovered with high levels. According to Pat Catanzareti of Weichert Realtors, the early response was like "doomsday...shut our houses down and move out of town," but as people learned more about remediation, it "eased the fear that this was a perpetual situation." Both agree that sales slowed down during that period--although Greco notes that the regional housing market had flattened during that time--but that prices never really went down and the market has rebounded completely.

While most of those interviewed talked of the high level of concern, Jim Drautman, a reporter for the Hunterdon Review, suggests that the response may have been "too relaxed," that people were not as concerned as the data suggested they should have been. Both Drautman and the other observers may be correct. While those in Clinton Knolls showed a high level of concern, many interviewed acknowledged that the concern was less widespread in the rest of Clinton and the surrounding area. John Beckley, director of the Hunterdon County Health Department, also noted that after an initial surge of concern, interest in the issue clearly tapered off. However, he noted that "One of the positive effects of Clinton [is that] the Hunterdon [County] community has a better grasp of radon, its problems, and solutions."

Although other research suggests that people often respond to radon risk with apathy, failing to mitigate even when confronted with high readings, this does not seem to be the case in Clinton Knolls.[2] According to Nicholls, all homeowners with greater than 20pCi/l have mitigated. A mail survey conducted by NJDEP's Mary Cahill in December 1986 elicited returns from 41 of the 105 homeowners in Clinton Knolls for whom DEP had test results. Of those respondents 23 had remediated and another 12 planned to remediate. (Five of the homeowners in houses EPA remediated did not respond to the survey, suggesting that failure to mitigate was not the sole reason homeowners did not respond to the survey.)

Boyertown

Reaction in Colebrookdale Township is more difficult to characterize. Traditionally, the area was composed largely of Pennsylvania Dutch families that have lived there for generations. But the rapidly developing community has become increasingly desirable to business people working in the Philadelphia metropolitan area, because new highways make the commute easier. Jones of People Against Radon says that reaction to the radon problem for the most part was split between the response of "the natives and the transplants," with the "transplants" being more concerned than the "natives."

Public meetings in Colebrookdale attracted hundreds of

people and had an atmosphere that Margot Hunt, then working for PADER, compared to the tension of a Superfund meeting. Bruce Dallas, then of PADER, also characterized the response as "potentially extremely disruptive." While PADER officials noted the easing of tension at the first public meeting, citizens Jones and Watras and Tell Tappan of Arix Sciences, Inc. suggested that there was a fair amount of disbelief and mistrust. Watras relates walking out of the public meeting and "hear[ing] the general public say, 'These people aren't telling us the whole truth.... They're holding something back....'"

The "skepticism and hostility" also noted by Jonathan Smoyer, the local emergency coordinator, may have been due, in part, to the nature of the community. As Richard Rehrer of Rehrer and Zuber Realty put it, "Most people living in the area had no recollection of anyone ever dying of radon...." As with Clinton, although real estate sales leveled off for a period of time, since then "demand has far outstripped supply," according to David Specht of Specht Realty, Inc. In fact, several of those interviewed in Boyertown felt that residents were relatively unconcerned about radon. LuAnn Reichert, Colebrookdale Township Manager suggested that despite being initially upset, "Now there's not nearly as much concern as there was initially. People have in their head that it's been here for many years and it's always going to be here...."

Because Colebrookdale Township marked the first discovery of such high levels of naturally occurring radon, the uncertainties that faced both the agency officials and Boyertown residents were huge. As PADER's Thomas Gerusky put it, the agency was initially "out on a limb" without much guidance from federal agencies. Although those interviewed, including real estate agents, reporters, and local officials, praised the government's efforts, some of the affected residents became sufficiently frustrated with what they perceived as the state's inadequate handling of remediation that they formed People Against Radon (originally known as Pennsylvanians Against Radon). Some view People Against Radon as a constructive force in the community, while others feel it is neither particularly credible nor representative of the community. Jones of People Against Radon claims that there are still homes in the neighborhood with measurements of over 200 pCi/l that have not been remediated, but Margaret Reilly of PADER feels confident that homeowners with such high levels have mitigated.

In sum, the public reaction to the discovery of radon seems to have included apathy and concern in both Clinton and Boyertown, but the responses appear to be more extreme--and marked by greater suspicion towards the government--in Boyertown than in Clinton. Although retrospective case studies cannot easily define the extent to which specific variables influenced public reaction, it is possible to suggest reasons for the differences.

While discovery of high radon levels in Boyertown was entirely unexpected, that discovery prompted in New Jersey development of a state program, subsequent media coverage, and some familiarity (if not concern) among homeowners about the issue. In fact, the town of Clinton already had a program in place for residents to order radon detectors at reduced cost. In the opinion of Alfred "Chick" Craig of EPA, who was involved in Clinton and, though less so, also in Boyertown, "When something happens the second time, it's not nearly the shock it is the first time." Being the second community to handle the problem, rather than the first, may have helped residents both accept the seriousness of the problem and reassure them that they were not alone. Craig also feels that Clinton residents would have been less likely to develop a citizen group to push for remediation of individual homes because by that time EPA had a clear policy not to mitigate homes except for research purposes. In addition, the inherent differences in the communities may have affected their responses. The Pennsylvania Dutch residents of Boyertown, who could point to generations of relatives who they felt were unaffected by radon, may have reacted with more complacency than the far more transient population of Clinton.

New Jersey officials, by virtue of already having initiated a radon program, were far more equipped to deal with Clinton. In fact, officials had discussed how they might handle the discovery of a home with a level such as Watras'. In addition, the EPA was better prepared to give NJDEP support quickly, allowing remediation efforts to become high profile rapidly. Just as important, New Jersey officials benefitted from the experience of their Pennsylvania colleagues, evaluating actions PADER had taken for their application in New Jersey. For example, says Donald Deieso of NJDEP, "We realized that free testing wouldn't be sustained in a state like New Jersey and in the long run would be limiting," due to dependence on the legislature for funds. Finally, as explained more fully in the following recommendations, New Jersey put in place what many observers noted was an uncommonly personable and sensitive team that worked with an outstanding local leader.

RECOMMENDATIONS

Those interviewed had some understandable difficulty remembering the details of what happened, but they were often quite clear about what should happen in similar situations. The following recommendations are based on the observations and recommendations of those we interviewed. Although these recommendations conform with findings of empirical research, because they are derived only from two case studies, they should be considered working hypotheses rather than proven truths.

Communicating about risks is often situational. Therefore,

these recommendations do not deal with setting priorities or developing compromises that are often important when government officials deal with complex issues. Instead, the goal of these guidelines is to provide a framework on which communication about radon risk can be constructed, not to give explicit directions for each situation.

A. Setting the Context

The effectiveness of a message depends not only on what is said but also on the context in which it is transmitted, that is, the actions and attitudes which accompany information that make it more meaningful to people. The extent to which the message is believable (and believed) can be tied closely to trust and credibility, which may be linked to the recommendations below:

A1. Take both the environmental hazard and community concerns seriously. Officials of both states reacted quickly, and soon radon became the subject of high-level attention in the agencies of both states. Money was "found" to provide testing, rules were "broken" to cut through red tape, staff were temporarily transferred to deal with radon, and high-ranking personnel started routinely putting in 18-hour days.

Although what agencies said was important, they were judged in large measure by what they did. In both Clinton and Boyertown those interviewed stressed the importance of moving quickly once the problem had been determined as serious. Just as important as acting competently, was their being visibly competent and committed. Both states held public meetings, had a staff out in the field doing testing, and established local offices.

As Judy Klotz of the New Jersey Department of Health put it, "The public saw a large number of high management, a very large effort, a very intense participation and investment and immediate turn around. Just in terms of what was visible, before anyone opened their mouths, this was clearly seen as a big operation." Craig also noted how important it was that "we instilled a feeling of confidence that we knew what we were doing." For example, the EPA research team and contractors examined 56 houses in 5 days. According to Craig, homeowners where "amazed" when within several days, they reported what they found to homeowners in one of the many homeowners' meetings conducted by state officials. Homeowners' surprise at such swift action may have reflected their expectations that government wouldn't move that quickly.

However, government officials not only took the need to reduce radon risk seriously, they took the homeowner concerns--even those not directly related to health--very seriously. Both Pennsylvania and New Jersey officials discussed concerns related to property values at length internally, at public meetings, and

with homeowners on a one-to-one basis. They also attempted to address these concerns in a variety of different ways, even though dealing with issues such as property values are not directly within the agencies' mandate. For example, the agencies' protection of confidentiality (see guideline A6) was driven, in part, by understanding community concerns about property values. PADER and NJDEP also worked to make low interest loans available because they thought addressing financial concerns was critical--even if indirectly--to reducing health risks.[3] The agencies' willingness to grant legitimacy to community concerns other than those that directly relate to environmental health may have been important to maintain credibility with homeowners who do not categorize their concerns along the same lines as agency mandates.

A2. Release information earlier rather than later. In both cases officials felt the urgency of the situation and released information relatively quickly to local officials and the public. Thus public reaction focused for the most part on other issues rather than government delay. As Tappan put it, "It's important to get to people as soon as possible with information and expertise...."

Mary Jane Schneider of the Boyertown Area Times noted the importance of PADER holding a public meeting soon after the announcement to the media. While NJDEP also released information quickly, Deieso stressed the importance of waiting until they "had a little more to offer than just saying we had found a couple of high homes." In fact, PADER was put in the difficult situation of needing to release information but having a great deal of uncertainty about what to say. Thus, some observers faulted PADER for releasing information as early as they did.

Several of the realtors interviewed would have preferred for officials in both states to withhold information until they had success remediating homes. However, it is doubtful the agencies could have kept the story from being picked up by the media. In fact, in Clinton reporters--not government--convened the first press conference by confronting officials outside the mayor's office.

In short, the damage to credibility caused by holding onto information might have been greater than releasing uncertain information earlier. However, when releasing tentative information, government officials can take care to ensure that the message is not confusing. (See guideline B2.)

A3. While reassuring some members of the community, also make sure to alert the others. Government officials in both Boyertown and Clinton were understandably very concerned about how to tell people about radon without panicking them. As Nulman explained, he often felt the tug to tell people "this is nothing to get

panicky about" but at the same time he didn't want to "make the problem less than it is." It is a natural tendency in explaining a serious risk such as radon to want to "backpedal," according to Tappan.

To make sure that homeowners took action, Nulman was widely quoted as saying, "If people don't get their houses checked, they should get their heads checked." Pennsylvania and New Jersey both offered free testing in the area surrounding the discovery house (which Pennsylvania later expanded to cover the entire Reading Prong). However, some of those interviewed admit that for understandable reasons they paid more attention to reassuring people with "hot houses" than to making sure other homeowners tested. In Clinton, says Drautman, who is a physicist as well as a reporter, "I think all of us played `it's a fixable problem' too hard. What we're saying now and what DEP is saying now, that everybody in this county ought to test, I think we probably should have been saying from the start." In Boyertown, efforts to reassure might have been confusing. For example, PADER's initial press release states radon "...is not a danger to the general population..." and a statement by an agency spokesperson in the Boyertown Area Times suggests that radon was "not a public health problem." Both statements were easily susceptible to misinterpretation.

To strike the appropriate balance between reassuring people and alerting them, government officials must be clear about their communication goals. Goals may evolve throughout the process of interacting with community; however, the greater the initial clarity, the more likely the goals will be met. "Damage control"--communicating without planning or planning with the primary goal of keeping the phones quiet--is not sufficient, particularly when people are apt to respond complacently. The experiences in Boyertown and Clinton suggest that agencies should make explicit the communication goal of alerting people to radon risk and then develop a communication strategy to meet that goal. (See Guideline C1 for more on goals and planning.)

A4. Develop a team effort among government officials. There was near unanimity in those interviewed in Clinton that Mayor Nulman's taking a leadership role in Clinton lent great credibility to the efforts of state and federal officials. While Deieso considers Nulman a "statesman," unique in his willingness to exert leadership rather than to assign blame, Nulman suggests that DEP also influenced his willingness to cooperate by maintaining daily contact, giving him home phone numbers, briefing him before the press and in general being "very careful, considerate, truthful."

Perhaps just as important, state officials showed eagerness to develop a partnership with the mayor, despite the obvious disparity in technical expertise. In fact, a type of parity was

established between Nulman's understanding of community concerns and the state's technical expertise, so that decisions were made collaboratively. Nulman suggests that one of the keys to success in Clinton was "great commitment to solving the problem rather than anyone winning, so when there was a problem...people went inside the team, rather than turning it into a win-lose situation." Beckley also noted that NJDEP alerting him prior to the media announcement and involving him in the process early on "was the beginning of trust...Right from the beginning the DEP made it a priority to advise us every step of the way."

While Hunt also spent considerable time talking with the Colebrookdale Township board of commissioners prior to alerting the media--and continued to alert them prior to any public announcements--there was not the same participation by local officials. This may be due, in part, to the board of commissioners generally playing less of a central leadership role in Colebrookdale than Nulman did in Clinton. Hunt also suggests that local officials may also have been reluctant to take a lead role on such a politically sensitive issue. Finally, township officials Smoyer and Reichert received the impression that the problem was too serious and technical for them to play a significant role. This suggests that agency officials might need to emphasize the potentially valuable role local officials can play.

In both Pennsylvania and New Jersey the agencies went to great lengths to coordinate state efforts with high level task forces. They also spent considerable energy enlisting cooperation from federal agencies. This may have been easier in New Jersey's case because radon was a recognized problem, and a certain amount of cooperation already existed among state and federal agencies on the issue. Perhaps just as important, because of Boyertown, EPA had policies and procedures in place.

A5. Allow for two-way communication with the community. Both Pennsylvania and New Jersey officials made concerted efforts to develop a dialogue with the community, thus by most accounts helping to reduce tension. Community meetings were marked by lengthy question and answer sessions, and all government officials spent hours on the phone listening to people's concerns and personally conveying test results. In Clinton continuing questions about health risks led to a session for homeowners on health risks. In fact, the Saturday meetings held fairly regularly for homeowners in Clinton at times were reported to be closer to an informal discussion than a government-sponsored meeting.

Informal communication and networks may have been almost as important as public meetings and briefings. Brennan tells the story of a homeowner who was not included in the EPA research project and felt particularly angry because he thought he had the highest radon level. Brennan not only corrected the mispercep-

tion but made it a point to stop by and meet with the homeowner and the contractor. Both Watras and Jones point out the importance of the private, off-the-record conversations they had with government officials.

However, Watras suggests that PADER's message in public meetings was more general and technical, rather than specific to people's concerns. Nulman also suggests that NJDOH's discussions with him were easier to follow than their formal presentations. Although it's obviously easier to talk to individuals than to go on-the-record in public meetings, officials may want to strive to develop a similar sense of openness and willingness to respond to concerns.

A6. Protect confidentiality of individuals while encouraging homeowners to talk with each other. The principle in both Pennsylvania and New Jersey of safeguarding the confidentiality of test results is now accepted practice. Officials went to great lengths to protect the confidentiality of homeowners by using unmarked cars, dressing informally, carrying equipment in non-descript bags, and withholding identifying information from the media.

However, a distinction needs to be made between protecting the identity of individuals and needlessly encouraging secrecy. Cahill feels that her sampling was made easier by people talking to each other about the program before she got to the door, and Brennan also noted informal networks among people that may have helped to reduce the stress. While NJDEP protected confidentiality by requiring homeowners to show invitation letters for "homeowner-only" meetings, these meetings by virtue of their intimacy may have also helped people to support each other and maintain a sense of community.

Further, it is important to be clear that the reason for confidentiality is to protect the privacy of homeowners, so it is not mistaken for government's trying to keep information from the community. In Boyertown, efforts to respect homeowners' privacy may have lent the situation an air of secrecy that was misinterpreted by homeowners, according to Jones.

A7. Anticipate how your actions will look to those outside the agency. Government officials often deal with public reaction to actions which seem logical, fair, and consistent to those in the agency but appear otherwise to those outside. Rather than deal with the confusion <u>after</u> the action has been taken, agencies can anticipate the reaction and (a) modify the action or (b) acknowledge in advance that the action might be misconstrued and explain it.

For example, in order to reduce charges of inequity and potential conflict with the community, NJDEP and EPA spent

considerable effort explaining the EPA research project in advance of announcing which homes were to be chosen. They were very clear during their initial discussions with homeowners that because EPA was conducting a research project, homes would be chosen for mitigation not merely on the basis of their levels, but also on other variables which were carefully spelled out for the homeowners. In addition, both Pennsylvania and New Jersey contracted for assessments and plans for other homes in addition to those chosen for the demonstration projects. Finally, in both states these plans were made available to all homeowners so that they all derived some tangible benefit from the research.

By contrast, when Philadelphia Electric announced it would remediate the Watras' home, some neighbors were extremely angry that he alone would receive help. What Watras describes as a "no-win situation" might have been handled a bit more sensitively by PADER, which might have anticipated homeowners' resentment and discussed the agency's efforts to help other homeowners. By failing even to acknowledge that some might see the situation as inequitable, the agency was faulted by some instead of credited for eliciting Philadelphia Electric's funding of a demonstration project. In fact, both PADER officials and Jones cite the Philadelphia Electric Company's announcement as the turning point which led to the formation of People Against Radon.

Some of the most agonizing discussions among officials in both states related to evacuation of families with high levels and how that might affect public response. While in both communities the families in the "discovery" houses left their homes temporarily, PADER made an official recommendation which NJ officials felt was unnecessary due to lower levels in the New Jersey discovery house.

Officials in Pennsylvania "felt they had a moral obligation if not the legal authority" to recommend that Watras leave his home, according to Gerusky. Even though statements to the media indicated that initial sampling did not find the same levels in other homes, it is clear from both our interviews and newspaper reports that the Watras family leaving their home woke up the surrounding community (and eventually the country) with a jolt. Although officials in New Jersey felt positive about being able to avoid officially telling the family to leave, Craig notes that the families leaving their homes in Boyertown and Clinton helped those communities to take the risk seriously. In fact, he notes that there are other communities where EPA has recommended testing and had little response; he suggests only partially tongue-in-cheek that if government could "just pass the rumor that the discovery house was very high and the person moved out," people would test.

A8. Acknowledge and deal with people's feelings. Officials in

both states recognized that people might be overly alarmed about concerns ranging from health risks to property values. They attempted to deal directly with people's concerns and spent considerable effort transmitting caring as well as facts.

As Hunt put it, "The agency's goal was to empathize with people." In both Pennsylvania and New Jersey officials at all levels spent considerable time "hand-holding," including extremely lengthy conversations with people about issues other than those within the agencies' mandates. NJDEP went so far as to remove an employee from the radon information line who wasn't able to help people talk through their concerns.

Cahill noted the importance of "taking a different approach with homeowners based on their reaction." In essence, Cahill and others tried to calm down homeowners who seemed overly excited and to "wake up" those who seemed insufficiently motivated to take action.

While indicating concern goes a long way towards creating good relationships between the agency and people involved, credibility is ultimately built by the translation into action. As NJDEP's Deieso put it, "From the first public meeting on, we promised, and then delivered."

Individuals' previous faith in government may also affect the extent to which trust is built during a particular situation. For example, because Watras generally has faith in government, which was bolstered by first-hand impressions of PADER representatives as "concerned and caring," Watras was willing to give them the benefit of the doubt in many instances. However, government may have to spend more effort on building trust and credibility with others in the community who are less trusting to begin with.

B. Explaining the Risk

A great deal of research has been conducted concerning ways to present information about radon risk most effectively.[4] The following recommendations derived from the case studies suggest some additional concerns for officials to consider when explaining radon risk.

B1. Make sure your message consistently emphasizes the potential seriousness of the problem and what people can do about it. Government officials in Clinton consistently gave what Michael Drewniak of the Hunterdon Democrat called the "bad news" (radon is a serious problem) and the "good news" (you can do something about it).

The dual nature of the message seems particulary important

in the case of radon, which unlike other environmental health risks poses a potentially serious risk and requires people to take individual action, rather than relying on government. The "bad news-good news" message can (a) alert the apathetic to have their homes tested and mitigate, if necessary, and (b) reassure those who have high levels that the problem is correctable.

The reinforcement of both parts of this message through the media, public meetings, and actions of state officials seems important to transform stress into meaningful action. For example, unless officials let homeowners know that radon problems can be solved, they will not be inclined to test. Success stories of reducing radon levels in homes elsewhere may be a key to both reassuring the alarmed and motivating the apathetic. As Tappan emphasized, "I wanted to put their minds at ease that it wasn't a problem that could not be coped with and handled...that it was a problem that had been dealt with in other places."

Craig suggests that "Once people understand the problem and that it can be mitigated, they looked at the problem more realistically." Therefore, while EPA and contractors were evaluating homes for the research project, they told people "If you are not chosen, these are the things we recommend you do immediately. Keep your windows open and that will take you to a safe level." Craig explained that by the next heating season, they hoped to have technology available that all homeowners could use.

B2. Acknowledge uncertainty while being clear about potential seriousness of the risk. In both Pennsylvania and New Jersey some observers noted that agency officials seemed far more credible because they admitted uncertainties about health risks. As Beckley suggests, "DEP told the truth.... They said 'We don't know' when they didn't.... That's the sort of public posture that leads one to trust." Schneider also pointed out that in Pennsylvania "There were a lot of uncertainties, and they were honest about it."

However, the uncertainties must be placed in context to avoid confusing people unnecessarily. For example, although extrapolating from occupational health studies involves a great deal of scientific guesswork, agencies feel the evidence strongly suggests that radon is a serious risk. Klotz attempted to put this uncertainty in perspective by saying scientists felt far more confident about the risks of radon than the risks posed by many of the substances people are concerned about in their drinking water in New Jersey. Klotz stressed the importance of explaining uncertainties but "being clear about priorities" so the bottom line about the potential for serious health risks comes through clearly. Stressing the uncertainties without putting them into context can create the appearance that the agency is revealing less than it knows, when, in fact, the agency

is attempting to be forthcoming.

Nulman took a pragmatic approach to explaining uncertainty by suggesting that regardless of the doubts, people should take action: "This is one of the few environmental hazards that you can do something about. Why ignore it?...Why not remove all doubt?"

Klotz noted the importance of addressing the uncertainties of translating risk probabilities to the individual level by anticipating "confusion ahead of time by saying we can't tell you exactly what your individual risk is."

B3. Put risk in perspective. Many interviewees stressed the importance of comparing radon risks to those more familiar to people. Pete Shellem, then of the Pottstown Mercury, emphasized the importance of "giving comparative data so people could make their own choices." Jones felt frustrated and confused about radon until the comparative risks were explained to her.

Government officials, reporters, and citizens for the most part preferred comparing radon to smoking than to other everyday risks. (Comparing other environmental problems to smoking is strongly discouraged because it compares a risk taken voluntarily to those which are imposed, such as industrial pollution. However, comparing radon risk to smoking may be effective because: (a) Natural risks feel less unfair than those "imposed" by government or industry; (b) Government was taking the problem seriously and using the comparison to alert people rather than to trivialize the risk; and (c) The outcome in both cases is lung cancer, which provides a stronger base for the comparison.) According to William Belanger, radiation specialist with the EPA, "Maggie Reilly had come up with the conversion that 20 pCi/l was equal to about one pack a day and that was a big thing we used to communicate risk because everybody was pretty aware of the risks of smoking..."

Officials noted that it is helpful to give people guidance about their levels but to avoid calling levels "safe" or "dangerous." Comparing readings to the federal action level of 4 pCi/l is critical to putting the risk in context. However, Klotz cautioned that it was important not to suggest that levels below 4 were "safe" or above 4 were "dangerous." Instead the EPA approach to correlating ranges with other information might be more useful. (EPA is funding further research on this subject.)

When officials are confronted with a new risk as in Boyertown, rarely are there established, uniform action levels. However, it may be useful to give information about levels of contamination that triggered actions in similar situations. For example, Tappan felt it critical in the absence of uniform federal guidance to tell Boyertown homeowners the readings that

had been used to guide government action in Colorado for homes built on uranium mill tailings as well as numbers used to deal with homes in Montclair, New Jersey built on contaminated fill. While these numbers can be given with appropriate caveats, failing to give them may lead to resentment. For example, Jones said that when Tappan told her, "If I had anything above a .02 WL I would want my home fixed," it was the first time she was "given a number to go by."

People can better understand their readings if they are explained in relationship to exposure: (a) one reading needs to viewed in terms of average yearly exposure; (b) a basement reading should be supplemented by readings in living areas to give an accurate picture of exposure; and (c) the amount of time spent in the home must be factored in.

However, all these comparisons must be used cautiously so they help people see their risk accurately rather than to minimize or trivialize risks. In order to represent the risk accurately, it might be most helpful to use several of the ways described above.

B4. Be forthright about the risk. Although it may be uncomfortable to discuss risks with people facing high levels of radon contamination, people cope better with information than without. As Jones explained, "They said 'You may not like what I have to tell you' and I said 'All I ask is that you be truthful and honest.'" According to Belanger, there are ways to put the risk information into context so that it is less frightening than just simply numbers: "I told her [Jones] not only the chances of dying of cancer, but a little more information.... [I asked] 'how long have you lived in this house?'...and looked at one-year risks...and said 'let's calculate what the risk is....' It was higher than you'd like to see, but it wasn't spectacular...." Belanger felt the explanation of the risk relieved Jones' mind, and Jones confirmed that Belanger's explanation helped her a great deal.

Being forthright about the risks also may be important so that people take the risk seriously. "I think you need to be right up front with them, be very honest.... Many homes still exist out there where there is a true health hazard," says Tappan.

B5. Deal with concerns other than health risks. When motivating people to test and mitigate, consider directly addressing concerns about property values. According to those we interviewed, many people other than those with very high readings seem to be equally, if not more concerned, about questions related to property values than they are about health risks. "Most of the homeowners were more interested in whether the house could be fixed if there was a problem," according to Tappan.

According to some we interviewed, government might go even further and use property values as a means to motivate people to mitigate. Tappan states, "I've found the best way to get the public's interest...is to relate it to the value of their property.... A home is probably the biggest investment they have in their lives, and they should protect that investment." A number of government officials say they informally urge people to think of property values if the health risk does not motivate them to remediate. But Belanger suggests he would feel more inclined to take this approach if he had some data about property values before and after mitigation. Realtor Greco said that her agency's emphasis was on advising people to find out and remediate before they went to contract to avoid problems later on.

B6. Address people's immediate concerns first. Then back up and fill in the scientific concepts. According to Klotz, the homeowner's meeting dealing with health risks was somewhat confusing and lengthy because NJDOH explained conceptual information about risk and embedded in those explanations more specific information about radon risk. Instead, Klotz and others we interviewed suggested that it makes more sense to address people's concerns directly and <u>then</u> give the scientific explanation. As Klotz put it, "Answer the questions in the context of [the science], but don't try to give a more formal conceptual lesson until their emotional needs have been expressed." Questions raised in New Jersey and Pennsylvania included:

"My daughter is 20 years old and has been living here all her life. You say the latency period is 20 years. Does this mean she is going to get cancer now?"

"What should we do about children's toys that have been in basements with very high radon levels?"

"Is there more lung cancer found in our area?"

"Will people have to leave their homes?"

"What about children?"

"What about real estate values?"

People also had many basic questions about remediation including concerns about how-to's, contractors, and financing.

Officials in both states were asked questions for which they didn't yet have answers. Experience of agency practitioners suggests that, in such cases, officials need to be clear about why they don't know the answer and, when possible, indicate what they are going to do to find out an answer.

B7. Be careful about drawing geographical boundaries. According to those interviewed, the initial information that radon was confined to the Reading Prong led to great confusion. Interest also tended to wane further from the designated "hot spots."

While no government official would now perpetuate the Reading Prong myth, officials might take care when dealing with a community's problem to avoid implying that the problem is confined largely to that community. In fact, when dealing with a problem in one area, officials might go out of their way to suggest that others get their homes tested. Greco pointed out that when a map was finally published that showed radon across the entire country, not just in the Reading Prong, it took some of the pressure off the Clinton area.

B8. Be as down-to-earth as possible. Nulman suggested that Nicholls' approach--"the perfect blend of scientist and school-teacher"--was the most helpful. "He talked in plain language and brought it to our level. We got the feeling that he wasn't doubletalking us. He was a big part of the success," said Nulman. Belanger feels it is important that a presentation be geared to the audience: "If I gave a scientific talk to the public, I'd be perceived as trying to mislead...or make it so complicated they couldn't understand. On the other hand, when you just use different words and different explanations...there are very few members of the public who can't understand what you're saying."

B9. Consider responding to concerns on a personal level. All the officials involved stressed the importance of being "the human voice from the faceless bureaucracy," as Hunt put it. In Boyertown and Clinton agency staff became part of the community. Some staff went so far as to give their personal perspectives on the dilemmas people were facing, such as "If I were you I'd plan to mitigate." While the officials were clear about the difference between "policy" and their personal sense of the situation, some officials felt the personal response helped people see the situation more clearly.

C. Holding Public Meetings

The public meetings in Boyertown and Clinton, by all accounts, were critical not only for conveying information to the public but also for setting the tone of the interaction between government officials and community residents. According to Craig, public meetings that include media coverage can be one of the best ways to get the word out. Based on his experience in Clinton and other communities with high levels, "Initial public meetings are very important, not only in explaining risk, but in telling people what they can do and being very clear about the role government can play." The success of public meetings

hinges on the factors discussed in the preceding sections and the following:

C1. Plan meetings carefully. Both New Jersey and Pennsylvania officials spent considerable time in top level, interagency meetings determining approaches to policy issues before the first public meeting. In addition, NJDEP and NJDOH devoted time, both separately and jointly, to clarifying goals for the meeting, outlining an agenda, determining who was responsible for material, developing approaches to explaining information, and anticipating likely questions and potential responses. PADER's Hunt also coordinated a "dress rehearsal" prior to the first meeting. "I couldn't overemphasize the need to sit down and develop a good plan and...properly rehearsed agendas so everyone is well aware of what the other person is going to say," states Tappan.

New Jersey officials emphasized the need for clear goals for the meeting, such as conveying the "good news, bad news" message explained in guideline B1. Telling people what they can do may be as essential as explaining to homeowners the seriousness of the problem. Also key was giving a sense of both government's competence and the importance of the community in solving the problem. "We wanted them to leave with the notion that this is not an untenable situation, and while we may not have all the answers to the problem, we were going to work collectively and cooperatively on it," says Nicholls. During a crisis, when there seems to be little time to discuss goals, it may be even <u>more</u> important to clarify them; when the situation is tense, there is less margin for error. Anticipating and planning for events that might occur, as NJDEP did by discussing in advance policies for evacuation of homeowners, can relieve some of the pressure and prevent some of the problems that may arise from "flying by the seat of the pants."

Agencies need to pay particular attention to preparing presentations that may be confusing or problematic, such as explanations of health risks, which many of those interviewed said easily became overly complex and technical.

C2. Choose carefully those who will represent the agency and coordinate their roles. Public meetings are important not only to convey information but to give the community direct access to government officials. While community residents generally don't have a lot of experience assessing technical information, they have a great deal of experience evaluating others' credibility. In fact, homeowners' judgments about the "messenger" may determine whether they believe the message. Thus, agencies should consider choosing spokespeople based on technical expertise and ability to communicate effectively and sensitively.

Nulman suggests that Nicholls, who is a radiation physicist

with a teaching background, was a "good plus" at the first public meeting. Hunt, on the other hand, advocates using community relations people as lead spokespeople "because a person who is trained in dealing with people, who does it instinctively, deals with the real gut issue.... Technical people are worried about how to count picocuries...." However, Tappan counsels that it is equally dangerous to rely on non-technical staff who are not entirely familiar with the subject matter, and he advises that agencies might be "well-advised to lean on technical people heavier." The mix of technical expertise and ability "to instill a feeling of confidence" is difficult to find, but essential for successful public meetings, according to Craig. One approach to developing this blend of "people skills" and technical expertise is to provide communications training for technical staff, augmented by on-going advice and feedback from community relations staff who serve as members of the team developing radon policy.

Tappan noted that sometimes it might be wiser to rely on a single spokesperson at a public meeting to reduce confusion due to "conflicting information." Others suggested that including spokespeople with expertise in particular areas--for example, mitigation and health risks--can be essential to give meaningful information. In fact, NJDEP officials suggested that having a number of spokespeople enabled them to clarify ambiguities and correct misimpressions that individual speakers might have failed to notice. However, they emphasized the need to coordinate presentations carefully to avoid confusion and duplication.

Tappan suggested that sometimes it's appropriate for agencies to bring in outside experts who can lend credibility.

C3. Consider involving local representatives as spokespeople. Local spokespeople who already have credibility with the community can lend an element of trust to the statements of outside officials. As Deieso put it, "Many times we will go into a meeting and the mayor is up there with us but it's very clear that it's not the mayor's meeting.... [But Nulman] provided an opportunity for what had to be said, and he fully supported everything we were saying.... The flavor was 'Trust these people; I trust them....'" Nulman felt that "If the public went away feeling there was a good effective partnership between the town and the state, that they weren't being given a line, and that there was a good plan, then the meeting served a purpose."

Almost everyone interviewed gave Nulman of Clinton a large measure of credit for helping to turn the stress into problem-solving. As Beckley suggests, "tensions kept turning back to facts.... He did not get on a soapbox and emotionalize it, [but] said they were going to work together to lick it." While this type of role can be played by officials from outside of the community, local officials who are respected in their communities

are probably more likely to have the necessary credibility.

C4. Anticipate questions, address those concerns in initial presentations, and leave plenty of time for additional questions. The initial public meetings in both Pennsylvania and New Jersey allotted substantial amounts of time for questions--at least as long as the presentations--and officials stayed as long as necessary to address community concerns.

Klotz suggested that presentations are most effective if they anticipate and address homeowners' immediate questions (see guideline B6). Deieso remembers New Jersey officials asking each other in advance "What are you going to say when they ask...?" and reviewing each other's responses. In both Pennsylvania and New Jersey agencies did some homework to respond to likely questions such as those regarding the lung cancer rate in the area.

While public officials grapple with issues at a policy or public health level, homeowners' concerns are quite personal. Although their questions may be posed in intensely personal terms, such questions often reflect the concerns of many others in the room and give agency officials an opportunity to clarify statements made earlier. While some questions may be better answered one-on-one after the meeting, Jones stressed the importance of being able to respond to bottom-line, personal questions publicly to avoid confusion and frustration.

C5. Use meetings to encourage people to take action. Agencies in both New Jersey and Pennsylvania used the public meetings not only to reassure people about high levels but to make it easy for them to test their homes. In Clinton testing kits were distributed at the meeting, and in Boyertown residents were encouraged to call PADER to have technicians come out and test.

C6. Hold meetings frequently in times and settings comfortable to the community and continue ongoing dialogue with the community. Craig emphasized the importance of frequent communication, instead of waiting to release a final report, in order to update homeowners on progress in their community. Frequent meetings and ongoing communication also provide an opportunity to reinforce the messages of previous meetings, build trust, and allow community residents to exchange information.

In both states meetings were held in the immediate community during hours when homeowners could easily attend. Although New Jersey officials were initially skeptical of Nulman's suggestion for holding meetings on Saturday mornings, the timing worked out well, adding an atmosphere of informality and allowing people to bring their children instead of having to hire babysitters. People also responded favorably to the agency officials going out of their way to be helpful: "People said 'Thank you for coming up

here on a Saturday.' It was as if we had donated something," said Nicholls.

C7. **Debrief and evaluate meetings.** Some of the agency officials interviewed for this project acknowledged that it would have been useful to debrief formally or to evaluate in other ways the strengths and limitations of their outreach efforts generally and the public meetings in particular.

Admittedly, a crisis atmosphere prevailed in both states, and officials worked long hours under tremendous pressure. However, even limited evaluation might have ultimately increased the effectiveness of agency officials and identified community attitudes or potential misunderstandings early. In addition, evaluation might have confirmed whether officials' perceptions of community response were, in fact, on target. Some of the interviews for this study, for example, revealed conflicting impressions of public response at the Boyertown meetings. More definitive feedback could have provided a better sense of homeowners' understanding of the radon problem, their motivation to test, other concerns, emotional response, trust in government officials, etc. Just as important, evaluation could serve as another way for homeowners to have input into the program being developed for their community.

Evaluation need not be elaborate to accomplish these objectives and could include short debriefing sessions among agency officials and one-page questionnaires completed by residents at the close of the meetings.[5]

In fact, NJDOH's Susan Klucharich developed a questionnaire that she mailed to homeowners to ask them to give feedback on the state's informational efforts. Klucharich's evaluation (which she suggests elicited generally favorable response) was hampered by a number of factors, such as limited return, that could be overcome by asking for feedback at meetings.

D. Communicating with the Media

Government officials in both states were extremely leery of the media sensationalizing the story of extraordinarily high radon levels. On the other hand, as Dallas suggested, "We felt an important aspect was education, and the press could help us do this." In fact, even a well-attended public meeting attracts only a portion of community residents. Media coverage is important to extend the impact of public meetings to others who should consider testing.

While agency officials dealing with Clinton and Boyertown found newspaper coverage in general to be what NJDEP's Jim Staples termed "about what you'd expect in a situation like

this," realtors, perhaps more sensitive to the immediate impact, were nearly uniformly dismayed by what they perceived as the media's over-attention to the sensational aspects of the problem. Nearly everyone who was interviewed regarding media coverage in Clinton also drew a clear distinction between TV and newspaper stories, voicing great concerns about TV reporters' disruption of residents' lives, predictions of doom, and inappropriate coverage.

Many of the suggestions in the preceding sections may be helpful to improving media coverage. The following are specific to dealing with the media:

D1. Alert local officials prior to the press and consider involving them as spokespeople. Officials in both states were scrupulous about briefing local officials prior to taking the story to the media. In Pennsylvania, Hunt called township supervisors individually to discuss the situation prior to briefing them in the presence of a reporter contacted by Hunt. New Jersey officials briefed Nulman, and he then chose to take the lead in dealing with reporters who were congregating outside his office. While NJDEP officials were quoted about technical concerns, Nulman gave a personal perspective that may have helped reassure readers: "...This is not the time for mothers to clutch their children and run into the streets."

D2. Initiate contacts with the media rather than delaying notification. Continue contact. As discussed earlier, delaying release of a story is likely to do more harm than good. According to Staples, "The longer you wait to notify the media, the more they will be curious about why you delayed. The more government lets people in on the action, the more they will respect government for forthrightness."

Neither Pennsylvania nor New Jersey officials notified the media through a technical briefing or press conference. In Pennsylvania a press release was issued several days after the briefing in the presence of the reporter. In Clinton, as Staples put it, "Reporters began to hear the jungle drums. They were one step ahead of our putting together a coherent presentation." Staples acknowledged that, although the NJDEP by all accounts did an excellent job of responding to inquiries, such a presentation might have been useful, particularly if more than a small number of local papers were involved. As Drewniak suggested, "If we don't have all the information, [sources] will see the story and say 'that's not the whole picture.' Just tell me the whole picture and we can avoid this from the outset."

Reporters in both states gave officials credit for being accessible throughout the story, but some agreed that holding technical briefings might have been useful. For example, although reporters talked afterwards with officials about the

information conveyed to homeowners in closed meetings, formal briefings might have led to additional coverage useful to homeowners outside of Clinton Knolls. Craig also suggests call-in shows as a good way to raise awareness, respond to homeowner concerns, and promote dialogue.

TV reporters may be particularly prone to run stories about radon as a "time bomb" and to project fear about property values. This may be due, in part, to the nature of the medium, which is forced to cover complex stories in short film bites. The negative focus may also be due to out-of-town reporters being less concerned about avoiding panic. Although concerned about TV reporters' tendency to blow the story out of proportion, Nulman decided they would do the story with him or without him and the story would be better with his perspective than without.

In fact, media consultants generally agree with Nulman that the best defense is a good offense; the most effective way to temper a negative story is to supply the positive side, with visuals for TV, if possible. Officials are now in a better position to temper "gloom and doom" stories with examples of successful remediation and the booming economies in both Clinton and Boyertown. While local reporters might want to highlight the "new" problem in the area, officials can explain the standard approaches to dealing with radon. In addition, government officials can supply TV reporters with visuals that are more appropriate than "For Sale" signs might be. For example, they can show how a radon detector or ventilation fan works. While these visuals might not replace shots of "For Sale" signs, they might help give the story a bit more balance. Working to help reporters cover the story more appropriately is far less time-consuming than trying to correct misinformation after the story has run.

D3. Be as clear, down-to-earth, and quotable as possible. Early media reports have the potential to set the stage for the story, framing it so that homeowners respond with appropriate concern. Downplaying the health risks may reassure people, but also promotes denial of a potentially serious problem. Some early press reports quoted PADER representatives as saying "This is not a public health problem" and that radon was "...not a danger to the general population." While the intent may have been to point out that the radon problem is tied to individual homes, such statements can be confusing. As discussed earlier, it may be more useful to stress what can be done, and what government is doing, to solve the problem. (Admittedly, this might have been difficult in Boyertown due to the uncertainty surrounding mitigation soon after the first hot spot was discovered.) Sources can point out explicitly what people can do to have their homes tested and the cost, if any.

Reporters covering Clinton gave New Jersey sources high

marks for being down to earth and understandable. "What [Staples] did best was to put it in terms that you could write in a newspaper for a layman...very informational and quotable," according to Drewniak. Nulman had a knack of putting the message in quotable statements people still recall. While most worked well, he regrets saying that Clinton was not a "Love Canal"--the negative assertion might have made the image more rather than less meaningful.

Anticipating reporters' questions can help prepare useful, coherent answers. Staples suggests that NJDEP appeared knowledgeable to reporters because as a former reporter he was able to predict what they would want to know and work with Nicholls to develop appropriate responses.

D4. Maintain the confidentiality of homeowners, but consider ways to help reporters cover mitigation. As discussed earlier, all government officials stressed the importance of maintaining homeowners' confidentiality. Staples suggests that government should treat homeowners' test results with the same degree of confidentiality that doctors treat their patients'.

PADER tried very hard, but failed, to keep Watras' identity confidential as he requested. Reporters, knowing that Watras worked for Philadelphia Electric and the general location of the home, were able to track him down relatively quickly. New Jersey officials may have been more successful protecting confidentiality because less identifying information was known about the "discovery" house.

Newspaper reports of Clinton briefly noted that the homeowners' identities were withheld due to state policy. However, a report in the Reading Eagle, that state officials "flatly refused to identify the family..." made officials sound furtive. Because reporters are particularly suspicious of any attempts by government to withhold information, government officials may need to stress why identifying information is being withheld, using the doctor-patient relationship as an analogy. Reporters are unlikely to be dissuaded from trying to track identities, but they may be less likely to accuse the state of secrecy.

While reporters in Clinton acknowledged that they could cover the story adequately without knowing homeowners' identities, Drewniak pointed out that it was far more difficult to write stories on remediation without examples. He felt that to get beyond basic information, he needed to talk to a homeowner who had remediated to discuss mitigation explicitly. Because "success stories" might encourage more people to test and remediate, it might be worthwhile for government officials to make it easier for reporters to cover remediation. Craig suggests that officials ask homeowners if they would be willing to speak to the press and, if so, give homeowners the telephone

numbers of reporters. Thus, officials could never be accused of giving out identities and the decision remains the homeowner's. Officials could also conduct remediation workshops or briefings that would give reporters better "news pegs."

IN CONCLUSION

It is not especially noteworthy that hindsight suggests ways agencies might have communicated more effectively. It is far more noteworthy that when faced with tremendous pressure and uncertainty the agencies communicated as well as they did. In both cases that effectiveness was due in large measure to officials' commitment to dealing with what they perceived as a serious health hazard. But nearly all government officials suggested that circumstances beyond their control--some used the word "luck"--played a large part. In truth, if Watras hadn't fortuitously worked for Philadelphia Electric, radon might yet be waiting to sound alarms.

Officials connected with Clinton attribute their success to circumstances that are difficult to replicate. The team was remarkable: a mayor with outstanding leadership abilities who was more interested in solving problems than casting blame; a radiation physicist with teaching experience; a press officer with extensive reporting experience; and other officials who were not only competent but by all accounts extremely personable and approachable. The hot spot was discovered when homeowners could open their windows to reduce their levels, thus reducing their fear and the pressure on government officials. And just as important, government officials had the benefit of the experience in Boyertown. As Deieso suggests, this combination of circumstances may never occur again. However, armed with the lessons learned during the Clinton situation, government officials may be able to cope better with communities where the circumstances are less ideal.

VERNON, NEW JERSEY

In June 1986 NJDEP officials unveiled a plan to deposit a blend of radium contaminated soil and "clean dirt" in a quarry in Vernon, New Jersey. The result was a government official's nightmare. In the following months the proposal precipitated opposition in the form of a stormy public meeting attended by approximately 3,000, a rally that attracted 10,000, and a demonstration at the Governor's mansion that brought demonstrators out in a caravan of hundreds of cars.

It is an understatement that public response in Vernon to radium-contaminated soil differed from that in Clinton and Boyertown to naturally occurring radon. In fact, a NJDEP official suggests that the only thing Vernon and Clinton had in common was "the r word." While the situation in Vernon was admittedly quite different than in the other communities, the following analysis suggests why public reaction in Vernon might have been so different and the extent to which the lessons learned in Clinton and Boyertown might have relevance to situations such as Vernon. As described in the Methodology section of this report, the events of Vernon and quotations from the participants are derived from a study conducted by Rutgers University's Eagleton Institute of Politics.

SUMMARY OF EVENTS

The radium-contaminated soil, which NJDEP tried to dispose of in Vernon, resulted from excavation around homes in Montclair, New Jersey. These homes had been built on contaminated fill from the radium ore processing industry that existed in New Jersey in the early 1900s. The excavation was part of a pilot study initiated by NJDEP in May 1984 to reduce what state and federal officials judged to be the significant health risks resulting from gamma radiation and radon in these homes, which are designated as part of a Superfund site. Although NJDEP had secured a permit in advance of excavation for out-of-state disposal of the soil, that plan was blocked by court challenges. By the time NJDEP tried to dispose of the soil in Vernon, there were 5,000 barrels on front lawns of homeowners in Montclair. Another 10,000 barrels were temporarily stored in Kearny, New Jersey, which was bitterly opposed by some members of that community. Thus, even before Vernon was proposed as a "host community," the situation in Montclair and disposal of the radium-contaminated soil was a high profile issue in the state.

NJDEP's idea of blending the contaminated soil with clean soil and then burying it was investigated by an engineering firm with a mandate from NJDEP to complete the on-going study in one week. Before Vernon was chosen as the site for soil blending and

burial, the concept was endorsed by NJDEP's Science Advisory Board, five scientists appointed to give NJDEP input on scientific issues, as well as by many Montclair officials. According to a NJDEP press release, Vernon was chosen after study of 900 sites, and nosed out another quarry site because restoring the quarry in Vernon would add 100 acres to park land. Although later disputed by the Vernon community, the agency felt that soil blending would reduce the risk of the Montclair soil to a minimal level.

The residents did not know in advance that their community was being considered as host for the dirt. According to the Eagleton study, "It was not until Commissioner Dewling met with town officials on the eve of the public announcement that anyone in Vernon knew of NJDEP's plan." Commissioner Dewling, surprised that local officials invited the media to what he considered a closed meeting, "simply announced that the Vernon quarry had been chosen to host the blended dirt," rather than discussing with municipal officials how to proceed. Within days the Vernon township attorney had filed suit to block the soil-blending plan. At the next township meeting the mayor took an active role in urging community opposition to the plan and appointed a group of citizens to advise the township. A delegation of citizens met with NJDEP and, dissatisfied with NJDEP's response, formed a citizen group with the stated goal of keeping the soil out of Vernon. Citizen opposition built to a public meeting in July of approximately 3,000 people, followed by a large protest at the Governor's mansion. In late July a rally to oppose the disposal of the soil was attended by 10,000 people. Meanwhile, NJDEP asked the group of citizens appointed by the mayor to review NJDEP documents in hopes the committee would agree that the blending plan was safe. Because a "radical faction" of Vernon residents threatened violence, civil disobedience training was offered as an alternative by a New York-based group, which organized its own protest rally of 3,500. In November NJDEP publicly announced that soil blending and disposal would not take place in the Vernon quarry.

ANALYSIS OF PUBLIC RESPONSE

The response of the Vernon community was obviously marked by anger. The question is why.

One of the ironies of the events in Vernon is that Vernon residents protesting the disposal of soil in the quarry in their community were potentially at risk from naturally occurring radon in their homes. Research indicates that most homeowners in New Jersey, including those in areas more likely to be at risk, do not plan to test.[6] Therefore it is extremely likely that the overwhelming majority of the thousands of protesters had not taken action to test for naturally occurring radon. In short,

Vernon residents reacted strongly to what NJDEP considered a negligible risk--the soil-blending plan--and failed to respond to a potentially serious one--naturally occurring radon. In addition, although several of the same officials were involved in both cases, Vernon residents responded with far more anger to NJDEP officials than did the Clinton community. There are a number of compelling reasons for these different reactions.

The story of citizen opposition in Vernon is not essentially a story about radon. It is a showdown between an agency and a community over an agency decision. NJDEP was perceived as importing an outside risk, as opposed to taking action to mitigate an existing one as in Clinton. While the agency firmly believed the risk of the blended soil was negligible, the community disputed the agency's process for bringing this risk to their town (which was called by the mayor a violation of the town's civil rights) as well as its assessment of the magnitude of the risk. In addition, according to Larainne Koehler, health physicist with EPA Region II, the residents of Vernon had already been engaged in a longstanding battle with NJDEP regarding the presence of satellite earth stations in the community. As a result, says Koehler, residents were "already sensitized--however unfairly--against DEP."

The events of Vernon illustrate (a) community resentment towards imposed risk; (b) the tendency to view imposed risks as more objectionable and therefore riskier than voluntary or natural risks which pose the same or greater threat; and (c) the community's commitment to fight the agency on any grounds.[7] In the case of Vernon, the contamination happened to be radioactive soil. In truth, the exact nature of the contaminant probably was relatively unimportant.

Whether appropriate or not, the community took the risk very seriously, while the agency was seen as dismissing both the risk and community concern about it. Marianne Reilley, a member of the citizen group and one of the residents appointed by the mayor to review NJDEP actions, charged that NJDEP dismissed citizen fears by calling the soil "just dirt." Thus, the agency, which was likely to be cast by the town as a villain for importing the risk, was viewed even more suspiciously for failing to respond to what the community felt were legitimate concerns. By responding belatedly to what it considered the inappropriate reaction of residents, the agency may have increased citizen hostility, and unwittingly helped to ensure that Vernon residents would perceive the agency even more negatively. Although the agency may have intended a softer approach with the community and felt sandbagged by the media and town officials from the outset, the agency's actions spoke more loudly to the community than its intentions.

Vernon residents didn't merely oppose the soil-blending plan, they opposed the agency. On the other hand, with naturally

occurring radon, there is no enemy, no target that can be identified with moving the risk or charged with unfairness for importing the problem from one community to another. Thus the risk is apt to be seen as less threatening, less unfair, and ultimately less serious. Furthermore, as discussed in the following section, government officials took the risk of naturally occurring radon seriously in Clinton and Boyertown, further reducing the likelihood of the agency being cast as villains or the community becoming overly alarmed.

The mayors of both Clinton and Vernon also took lead roles in shaping community response. The mayor of Clinton, who viewed NJDEP officials as part of the solution to his community's radon problem, not as part of the problem, made a commitment to work with NJDEP officials and urged community residents to do the same. On the other hand, the mayor of Vernon, who could easily view NJDEP as part of the problem rather than as part of the solution, worked against NJDEP to eliminate the problem from his community and urged community residents to do the same. Thus, while both mayors might have seen themselves as working to protect their communities, the mayor of Clinton both reassured people about the level of the risk and urged citizens to test and mitigate for radon. The mayor of Vernon acted to protect the community by alarming people further about the risk and suggesting actions people could take to fight both the risk and the agency that sought to impose it.

There may have been other factors which influenced the reaction of Vernon residents and distinguished it from their own reaction (or Clinton's reaction) to naturally occurring radon. For example, people are likely to perceive their homes as "safe" places. It may be difficult to convince them that something they can't see or smell makes their homes hazardous.[8] On the other hand, the Vernon community's perception of the risk was influenced by highly publicized images of drums on Montclair lawns and all the negative connotations that accompany chemical drums. In addition, the potential risk in Vernon was ultimately from an industrial source, which is likely to be viewed as inherently more dangerous than a "natural" risk.

Risks that are not susceptible to individual control are also apt to be seen as more threatening.[9] While naturally occurring radon can be mitigated by the individual, the perceived threat in Vernon seemed entirely under government control. In Clinton government officials increased the community's sense of control--and reduced the likelihood of undue alarm--by suggesting ways individuals could test and mitigate. Officials further helped the risk seem less threatening--and increased the community's trust in NJDEP--by providing other actions for people to take, such as calling NJDEP's information line, talking to NJDEP staff at the municipal building, attending homeowners' meetings, etc. In contrast, in Vernon people responded to a lack of

individual control over the risk by collective resistance to government's control. Thus, the individual actions people could take--from signing a petition to taking part in civil disobedience training--were suggested by those who opposed the soil blending and NJDEP.

RECOMMENDATIONS

The central issues in Vernon were ones of equity and control. The agency attempted to impose a risk on the community, seeing the risk as negligible and therefore acceptable. In turn, the community resisted the imposition of the risk, the agency's definition of the risk as minimal, and the agency's right to determine the acceptability of the risk. While the agency spent considerable energy attempting to convince the community that the risk was negligible, the community remained skeptical and continued to fight both the risk and the agency that sought to impose it without consultation. Thus, the scenario in Vernon has far more in common with the siting of hazardous waste facilities than it does with alerting communities to radon risk.

The successful interactions with the communities of Boyertown and Clinton are unlikely to hold the key to siting, when years of research and a multiplicity of models around the country have failed to yield clear answers. Although the experiences in Boyertown and Clinton do not suggest ways to ensure that an agency can successfully site a facility or a quantity of slightly contaminated dirt, they can suggest ways to avoid needlessly increasing the tension between agencies and communities. The following brief analysis suggests which recommendations from the case studies of Boyertown and Clinton may have relevance to siting situations such as Vernon's.

Setting the Context

As illustrated by Vernon, communities often perceive risks differently than agencies. But the problem doesn't end there. An agency's response to the risk is understandably based on the agency's assessment of the risk, not the community's assessment. For example, NJDEP did not arrange information telephone lines, staffing of an on-site office, and EPA support in Vernon as it did in Clinton because agencies are less likely to commit such resources to problems they consider less serious.

In contrast, government agencies discovered the radon hazard in Boyertown and Clinton and essentially rode into town to protect homeowners from the threat. Because agency officials were aware that the town could mistakenly cast them as villains, they worked diligently to cast themselves in positive terms. The agency officials' response to the community also differed from

their response in Vernon, in large part, because of agency officials' assessment of the risk. The agency took community concerns very seriously, because the officials considered the risk serious.

Unfortunately, when agencies seem to be responding lightly to risks that communities see as serious, they thereby increase, rather than decrease, the disparity in the perceptions between the community and the agency. When faced with what it perceives as agency unwillingness to take its concerns seriously, the community will often, as in the case of Vernon, increase its insistence that the risk is unacceptable and continue to raise the level of its opposition.

Agencies are thus faced with a dilemma. If a community perceives a risk as serious but the agency perceives the risk as minimal, a minimal response from the agency is likely to further alarm and anger the community. However, agency officials are understandably reluctant to make large commitments of agency resources to problems they see as minimal. While there is no easy way to deal with this conundrum, agencies need to recognize early those problems which communities are apt to view more seriously than the agency. In particular, agencies should realize that risks imposed by outside sources are more likely both to be resented and to be seen as serious.

At minimum, agencies should look towards involving communities in decision-making processes that are as equitable as possible. As Deputy Commissioner Michael Catania suggests, "We should attempt a restoration of faith. That is what the advisory board [citizens and scientists appointed by NJDEP after the events of Vernon to make recommendations about disposal of the barrels of soil from Montclair] is trying to do. Instead of our consultant doing the work, we should have the people from the towns and environmentalists participate...."

Agencies must become particularly aware of the effect their actions (or inaction) will have on the community (guideline A7) and strive even more diligently to allow two-way communication with the community (guideline A5). (While NJDEP did schedule availability sessions with the community, they were held after a decision had been made. Hence, they were too little, too late for the community to feel like dialogue was taking place.) Just as important, communities must be given information quickly, so the agencies' withholding of information is not allowed to become a key issue (guideline A2). In addition, agencies must work even harder to gain the trust of local officials, while realizing that close teamwork between the officials imposing a risk and those being handed a risk is quite unlikely. However, failure to treat local officials with a great deal of sensitivity and consideration is apt to increase hostility and distrust (guideline A4).

Finally, agencies need to do careful science even when they're confident the risk is trivial.

Explaining the Risk

The events in Vernon suggest that when an agency sees a risk as less serious than the community does, agency efforts focused on proving the minimal nature of the risk may be ineffective at best and explosive at worst. An agency's insistence that its view of the risk is "right" and the community's is "wrong" is likely to escalate the power struggle. Instead, agencies should give equal attention to setting the context for explaining the risk and building credibility with the community.[10] As Grace Singer, chief of NJDEP's Community Relations Bureau, acknowledged, by the time of the public hearing "the town was in such an ugly mood, almost nothing would have satisfied them."

Alerting people to risks they view with apathy differs from reassuring people about risks they view with alarm. Reassuring people is particularly difficult if the goal of agency officials is to push them to also accept the risk, as in Vernon, rather than to mitigate the risk, as in Clinton and Boyertown. Regardless, officials are better off leading with the uncertainties rather than waiting for community residents to point them out, further undermining trust in the agency (guideline B2). Similarly, officials should be seen as being forthright about the risk, even if the risk is minimal (guideline B4). The resentment in Reilley's remark shows the risk officials run by failing to acknowledge the uncertainty: "In Montclair it was hazardous, contaminated soil. Here it becomes 'just dirt.'" Although officials believed the risk of the Montclair soil would be reduced to insignificant levels through blending, their response seemed to the community to deny that the soil had ever been a risk.

When an agency seeks to explain a risk it believes is minimal to an audience that believes the risk is serious, the agency must be very cautious about how it puts the risk in perspective (guideline B3). Unlike the case of naturally occurring radon, officials must guard against comparing risks that people take voluntarily with those that are imposed, such as the soil-blending plan. Thus, comparisons of smoking (a voluntary risk) to soil blending (an involuntary risk) would have made people even angrier. Similarly, comparisons which seem intended to trivialize the risk will be resisted by the community, as will statements that imply that community residents can't adequately comprehend the nature of the risk. As another citizen leader explained, "What kind of mentality do they think we have? If it's 'just dirt,' why move it?"

Perhaps most important, officials need to deal with people's immediate concerns, and as in Clinton and Boyertown should be prepared to discuss issues that may be traditionally considered outside the agency's purview (guidelines B5 and B6). For example, in Clinton and Boyertown agency officials discussed concerns about property values and took steps to address those concerns. However, the Eagleton case study suggests that agency officials were less tolerant in Vernon of concerns about property values. "...At face value a lot of things look like a community is outraged for environmental reasons...and for health reasons," said Assistant Commissioner Donald Deieso, who implied that community leaders' interest in plans for building condominiums near the site might have been at the root of their opposition.

In truth, however, most communities that feel a risk is being imposed without "due process" are likely to oppose that risk on any grounds possible. Because the agency's and the community's notion of due process differ, it is wise to solicit community input on procedures. Most efforts to make the community understand risk as the agency does are unlikely to be successful if the community feels vulnerable, angry, and untrusting.

Holding Public Meetings

Most of the recommendations for holding public meetings that were cited earlier in this report also apply in situations such as Vernon. When dealing with a hostile community it is even more important to plan meetings well, choose spokespeople carefully, anticipate questions, and evaluate the meeting. However, public meetings in a community that is largely angry and greatly committed to opposing an agency, as in Vernon, are not very conducive to constructive dialogue. It is very difficult for them to be anything but confrontations that give both sides an opportunity to go on the record. To the extent possible, in situations where the community is likely to be hostile, agencies should hold small, informal problem-solving meetings with those affected. These meetings are apt to be more constructive if they are part of a decision-making process rather than merely an opportunity for the public to respond to a decision the agency has already made.[11]

Communicating with the Media

Most of the recommendations from Boyertown and Clinton also extend to situations such as Vernon. However, as with public meetings, by the time the issue is a battle, fighting it out in the press is unlikely to help the community better appreciate the agency's position. On the other hand, if an agency fails to implement the recommendations such as alerting the press early--

but after public officials--and making clear, quotable statements, the agency may worsen the situation.

A FINAL NOTE

Attempts to import a risk to a community, even a small risk, will often elicit opposition. Failing to involve the community in the decision-making process will virtually guarantee it. Once the risk and the agency are perceived as "the enemy," changing that image is very difficult. Implementing the suggestions from the examples of Boyertown and Clinton may not help tremendously. However, failing to implement the suggestions will worsen the situation. When communities are extremely sensitive to risk, agencies need to respond even more sensitively--while recognizing that their efforts may not be immediately rewarded by greater respect from the community.

NOTES

1. Van Horn, Carl, Jim Berzok, and Caryn Paul, "It's Just Dirt: A Case Study of Radium-Contaminated Soil in New Jersey," Eagleton Institute of Politics, Rutgers University, May 1987.

2. Weinstein, Neil D., Peter M. Sandman, and Mary Lou Klotz, "Public Response to the Risk from Radon, 1986," Division of Environmental Quality, New Jersey Department of Environmental Protection, January 1987.

3. It should be noted that Pennsylvania has since abandoned its low interest loan program that elicited little response. While low response may have been another indication of homeowners' complacency, it may have been due, in part, to other factors. For example, Jones pointed out that the process for obtaining such loans was extremely burdensome.

4. Some of the analysis and research about explaining radon risk:

   Chess, Caron, "Recommendations for the New Jersey Department of Environmental Protection's Radon Communications Program: A Working Document," Office of Science and Research, New Jersey Department of Environmental Protection, Trenton, NJ, April 1986.

   Edelstein, Michael R., and Valari Boyle, "Media and the Perception of Radon Risk," in William Makofske and Michael Edelstein, eds., Radon and the Environment (Mahwah, NJ: Institute for Environmental Studies, Ramapo College of New Jersey, 1986), pp. 233-240.

   Fisher, Ann, Kerry Smith, Bill Desvousges, and Reed Johnson, "EPA Radon Communication Studies: What Have We Learned?" Workshop on "Communicating the Radon Risk: The Roles of Journalists, Scientist, and Public Health Officials in Informing the Public about Radon," New York University Science and Environmental Reporting Program and Georgetown University Medical Center Institute for Health Policy Analysis, New York, NY, March 13, 1987.

   Johnson, F. Reed, and Ralph A. Luken, "Radon Risk Information and Voluntary Protection: Evidence from a Natural Experiment," Risk Analysis, 1987, pp. 97-107.

   "Radon Risk Communication Project Interim Report," Program Evaluation Division, Office of Policy, Planning, and Evaluation, U.S. Environmental Protection Agency, October 27, 1987.

Sandman, Peter M., Neil D. Weinstein, and M.L. Klotz, "Public Response to the Risk from Geological Radon," Journal of Communication, Summer 1987, pp. 93-108.

Smith, V. Kerry, William H. Desvousges, Ann Fisher, and F. Reed Johnson, Communicating Radon Risk Effectively: A Mid-Course Evaluation, prepared for the Office of Policy Analysis, U.S. Environmental Protection Agency, under Cooperative Agreement No. CR-811075, by Vanderbilt University, Nashville, Tennessee, and Research Triangle Institute, Research Triangle Park, North Carolina, 1987.

Weinstein, Neil D., and Peter M. Sandman, "Recommendations for a Radon Risk Communication Program," Office of Science and Research, New Jersey Department of Environmental Protection, November 1985.

5. Evaluating Risk Communication Programs: Quick and Easy Methods for Government by Mark Kline, Caron Chess, and Peter M. Sandman will be available in Fall 1988 from the Environmental Communication Research Program, Rutgers University.

6. Weinstein, Neil D., Peter M. Sandman, and Mary Lou Klotz, "Public Response to the Risk from Radon, 1986," Division of Environmental Quality, New Jersey Department of Environmental Protection, January 1987.

7. Slovic, Paul, "Informing and Educating the Public About Risk," Decision Research, Eugene, Oregon, May 1985.

8. Sandman, Peter M., Neil D. Weinstein, and M.L. Klotz, "Public Response to the Risk from Geologic Radon," Journal of Communication, Summer 1987, pp.93-108.

9. Slovic, p.19.

10. For more detail on building the context for explaining risk, see: Hance, Billie Jo, Caron Chess, and Peter M. Sandman, Improving Dialogue with Communities: A Risk Communication Manual for Government, Environmental Communication Research Program, Rutgers University, December 1987.

11. Ibid.

APPENDIX

LIST OF INTERVIEWEES

BOYERTOWN INTERVIEWEES

Federal Government

William Belanger
Regional Radiation Representative
Air Management Division
Region III
US Environmental Protection Agency
Philadelphia, PA

Stanley Laskowski
Deputy Regional Administrator
Region III
US Environmental Protection Agency
Philadelphia, PA

State Government

Bruce Dallas
Formerly: Press Secretary
PA Department of Environmental Resources
Harrisburg, PA
Presently: Associate Director
Associated Petroleum Industries of PA
Harrisburg, PA

James Fox
Public Health Physician
Division of Environmental Health
PA Department of Health
Harrisburg, PA

Thomas M. Gerusky
Director
Bureau of Radiation Protection
PA Department of Environmental Resources
Harrisburg, PA

Margot Hunt
Formerly: Director of Community Relations
Office of the Secretary
PA Department of Environmental Resources
Harrisburg, PA
Presently: Vice President
Enviroservices, Inc.
Devon, PA

James Logue
Director
Division of Environmental Health
PA Department of Health
Harrisburg, PA

Margaret Reilly
Chief, Division of Environmental Radiation
Bureau of Radiation Protection
PA Department of Environmental Resources
Harrisburg, PA

Local Government

LuAnn Reichert
Township Manager
Colebrookdale Township
New Berlinville, PA

Jonathan Smoyer
Emergency Coordinator for Colebrookdale Township
Director Bldgs, Grounds & Transportation
Muhlenberg School District
Boyertown, PA

Contractors

Tell Tappan
Vice President, Sciences Division
Arix Corporation
Grand Junction, CO

Realtors

Richard Rehrer
Rehrer & Zuber Realty
Gilbertsville, PA

David Specht
Specht Realty, Inc.
Pottstown, PA

Reporters

Bill Bradley
Reporter
Reading Eagle/Reading Times
Reading, PA

Mary Jane Schneider
Editor
Boyertown Area Times
Boyertown, PA

Peter Shellem
Formerly: reporter, Pottstown Mercury
Pottstown, PA
Presently: reporter
Patriot News
Carlisle, PA

Citizens

Kay Jones
President
People Against Radon
Boyertown, PA

Stanley Watras
Sr. Construction Engineer
Limerick Generating Station
Boyertown, PA

CLINTON INTERVIEWEES

Federal Government

Alfred "Chick" Craig
Senior Science Advisor for Radon
Air & Energy Engineering Research Laboratory
US Environmental Protection Agency
Research Triangle Park, NC

State Government

Mary Cahill
Radiation Physicist
Radiation Protection Branch
NJ Department of Environmental Protection
Trenton, NJ

Donald A. Deieso
Assistant Commissioner for Environmental
Management and Control
NJ Department of Environmental Protection
Trenton, NJ

Judy Klotz
Coordinator of Radon Projects
Division of Occupational and Environmental Health
NJ Department of Health
Trenton, NJ

Susan Klucharich
Formerly: Health Educator Radon Project
Division of Occupational and Environmental Health
NJ Department of Health
Trenton, NJ
Presently: Office of Patient Education
M.D. Anderson Hospital and Tumor Institute
Houston, TX

Gerald P. Nicholls
Assistant Director for Radiation Protection Programs
Radiation Protection Branch
Division of Environmental Quality
NJ Department of Environmental Protection
Trenton, NJ

James Staples
Public Information Officer
NJ Department of Environmental Protection
Trenton, NJ

Local Government

Robert Nulman
Mayor
Clinton, NJ

John Beckley
Director
Hunterdon County Health Department
Flemington, NJ

Contractors

Terry Brennan
Camroden Associates
Rome, NY

Jim Davidson
President
Radon Detection Services
Ringoes, NJ

Realtors

Pat Catanzareti
Assistant Manager
Weichert Realtors
Clinton, NJ

Mickey Greco
Manager
Schlott Realtors
Clinton, NJ

Reporters

Jim Drautman
Reporter
Hunterdon Review
Clinton, NJ

Michael Drewniak
Formerly: Staff Writer
Hunterdon County Democrat
Flemington, NJ
Presently: Staff Writer
The Courier-News
Flemington Bureau
Flemington, NJ

Jeanette Rundquist
Formerly: Reporter
The Courier News
Bridgewater, NJ
Presently: Reporter
The Star-Ledger
Somerville, NJ