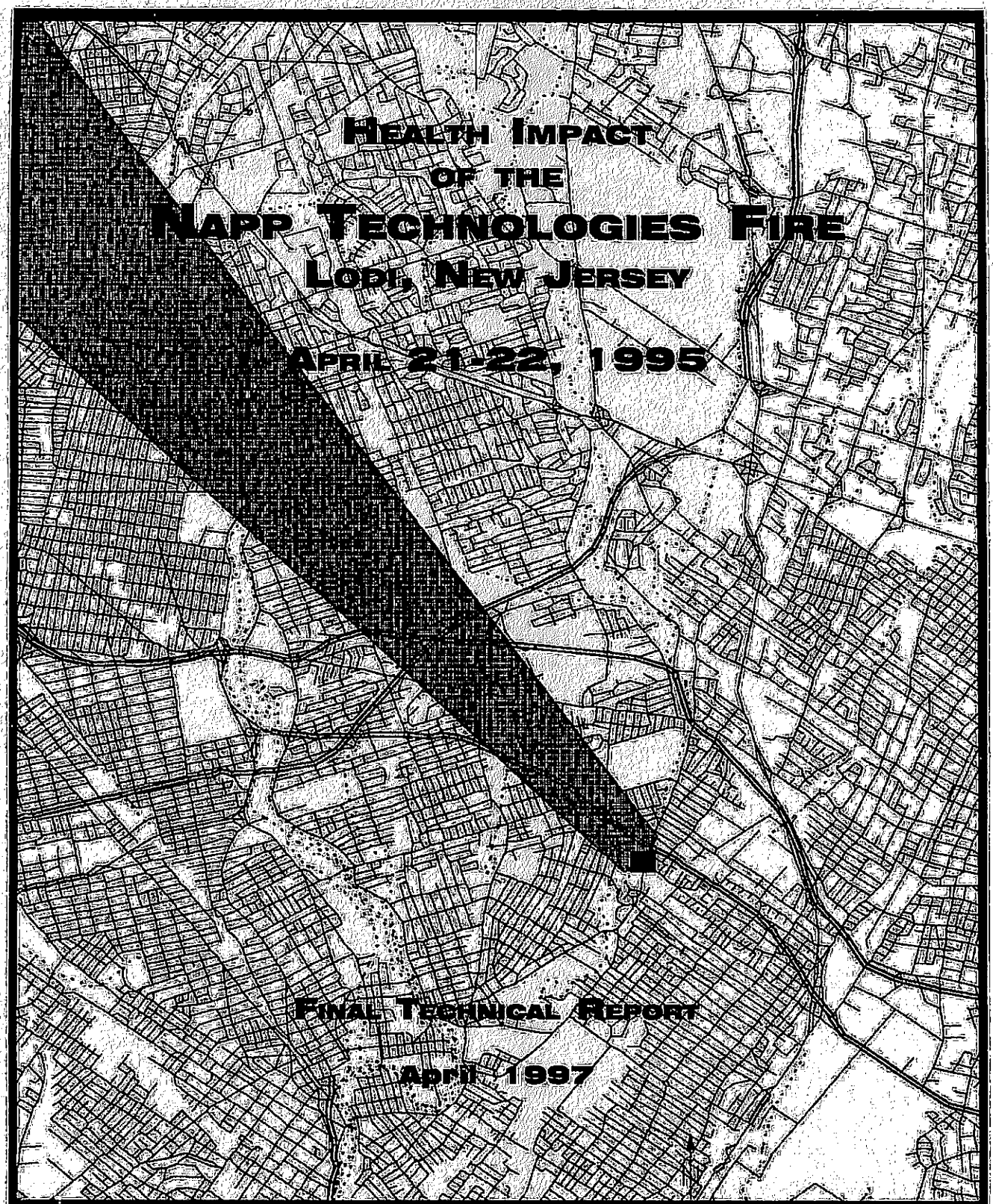

Health Impact of the Napp Technologies Fire

Lodi, New Jersey

April 21-22, 1995

Final Technical Report

April 1997

Division of Environmental and Occupational Health Services

New Jersey Department of Health and Senior Services

Christine Todd Whitman
Governor

Len Fishman
Commissioner of Health
and Senior Services

HEALTH IMPACT OF THE NAPP TECHNOLOGIES FIRE

LODI, NEW JERSEY, APRIL 21-22, 1995

FINAL TECHNICAL REPORT
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DEDICATION

This report is dedicated to the memory of the five individuals killed by the explosion and fire at the Napp Technologies, Inc. facility in Lodi, and to the hundreds of emergency responders who risked life and limb to extinguish the fire, evacuate and treat the injured, provide support and comfort, and ensure the public's health and safety.

ACKNOWLEDGEMENTS

The following report was prepared by Jerald Fagliano (Consumer and Environmental Health Services) and Helga Fontus (Occupational Disease and Injury Services) of the New Jersey Department of Health and Senior Services, under the direction of Dr. Elin A. Gursky, Senior Assistant Commissioner.

Numerous individuals contributed to this investigation and report, including: Kathleen O'Leary, Martha Stanbury, Bonnie Bishop, Dr. Barbara Gerwel, Gary Ludwig and Eric Beckhusen of Occupational Disease and Injury Services; James Brownlee, Myrna Rivera and Dr. Bruce Wilcomb of Consumer and Environmental Health Services; Mark Guarino, Pat Hegadorn, Margaret Macali, Lizz Angevine, Elaine Rizzo and Nancy McGlade of the Bergen County Department of Health Services; and Dr. Sandra Mohr of the University of Medicine and Dentistry of New Jersey/Robert Wood Johnson Medical School.

We thank the physicians and staff of the Hackensack Medical Center who provided emergency care for the individuals affected by the event, and particularly Dr. Hormuz Ashtyani for his cooperation in this investigation. We also thank the Fire and Police Chiefs, Captains of Emergency Medical Service squads, and heads of other agencies for their cooperation and assistance.

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1. Introduction and Background

1.1. Description of the Napp Technologies Event

At 7:47 on the morning of April 21, 1995, an explosion and fire occurred at the Napp Technologies, Inc. facility at 199 Main St. in Lodi, New Jersey (NJDEP, 1995). The blast and fire killed four Napp employees at the scene; a fifth employee died later of injuries suffered during the event. The fire burned for several hours, consuming much of the facility and its contents, and required the coordinated emergency response of numerous local, state and federal agencies to control and extinguish the flames. A plume of smoke from the fire drifted over residential and commercial areas for several miles to the north and west, prompting the evacuation of hundreds of residents, school children and local business operators. Runoff from the scene contaminated the adjacent Saddle River and caused a fish kill. Maps of the extent of the plume (Figure 1-1) and the location of the Napp Technologies facility (Figure 1-2) follow this section.

The specific sequence of events leading up to the explosion and fire is under investigation by the U.S. Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA). The explosion occurred in a mixing vessel containing aluminum powder, sodium hydrosulfite, potassium carbonate, and benzaldehyde, which was to become a product used to precipitate gold from solutions. Several Napp employees were in the vicinity of the mixing vessel at the time of the explosion. The Napp facility contained a large variety of chemicals which were destroyed, altered, and/or dissipated by the fire and firefighting activities.

Over 900 emergency personnel responded to the event at Napp Technologies, including firefighters, police and sheriff staff, emergency medical technicians (EMTs), public works staff, local health officials, state and federal agencies, and volunteer aid organizations. Emergency personnel were drawn from Lodi and at least 30 neighboring municipalities. Appendix A contains a list of agencies involved in the emergency response. Firefighting extended through

the day of April 21. Injured Napp employees, firefighters and EMTs were treated on scene and/or taken to the Hackensack Medical Center for examination and care. Investigators began to examine the scene and remove the bodies of the explosion victims on the afternoon of April 21.

By the morning of April 22, the fire scene was declared under control, although several spot fires flared through the day as investigations continued and remedial and demolition activities commenced. Over the next days and weeks, the site was secured and investigated by local, state and federal officials.

After a six month investigation, OSHA issued a Citation and Notification of Penalty to Napp Technologies, Inc. on October 17, 1995. The Citation listed 16 serious and two willful violations and fined Napp a total of $127,000 (OSHA, 1995).

1.2. Public Health Concerns

The event at the Napp Technologies facility, resulting in the tragic deaths of five Napp employees, raised several public health concerns. In the aftermath of events like the one in Lodi, it is important to evaluate the effects of the event on public health. How many people (workers, residents, emergency responders) were immediately affected by the event? What kinds of health impacts were observed or experienced? What medical treatments were affected persons given? It is also important to consider the potential for long term health effects that may be experienced by those with acute exposures to smoke from the fire.

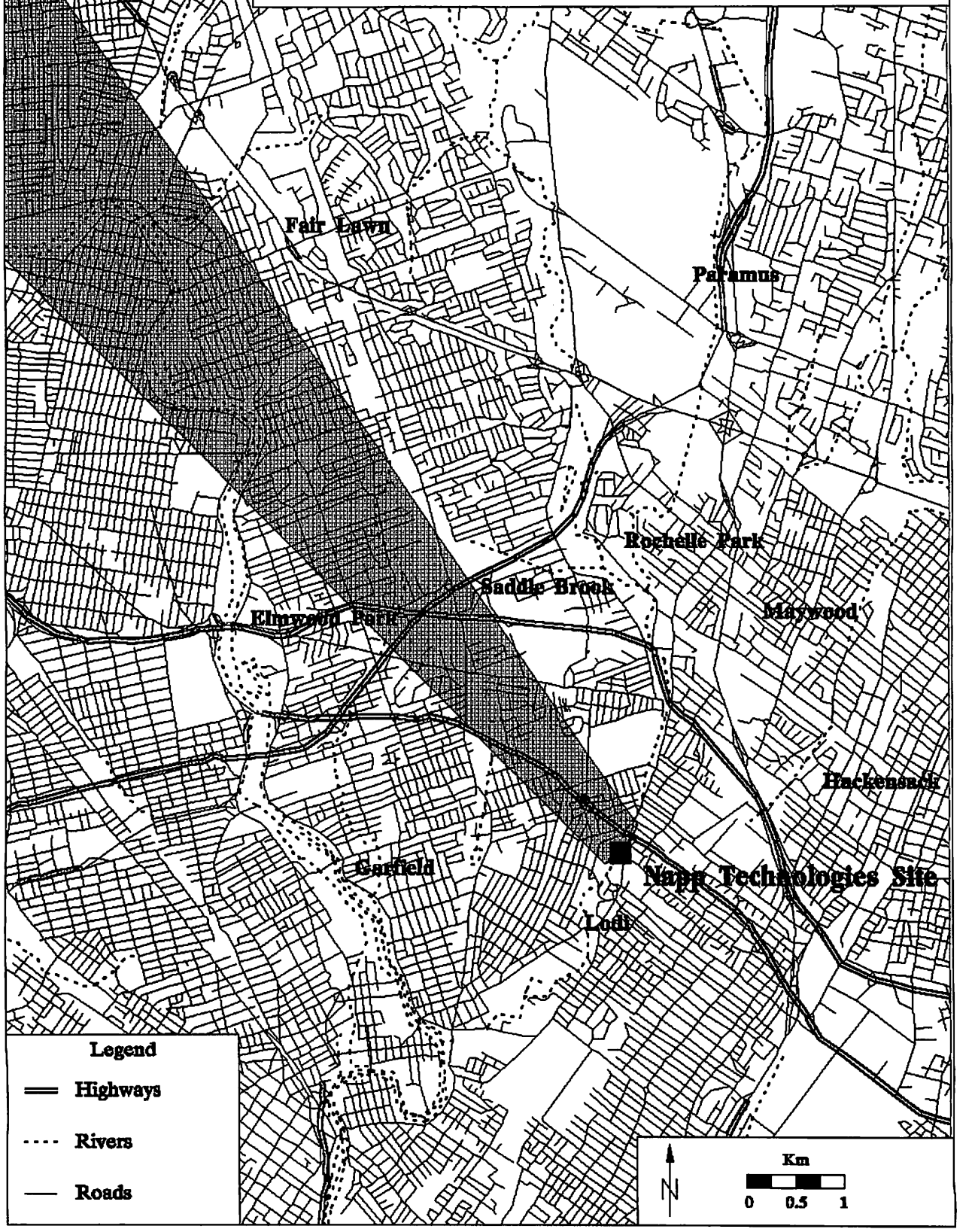
The health risk to emergency responders and nearby populations who may be exposed to hazardous materials during a fire is often difficult to assess. In events involving combustion of chemical mixtures and building materials, the specific by-products of combustion are not usually known at the time of the event or after. Quantifying exposure with accuracy is a difficult task due to the dynamic conditions of an emergency event. The first responsibility of emergency responders is to protect the public from exposure to the resulting smoke regardless of its specific chemical nature.

The activities of emergency responders may expose them to potential harm from flames, smoke, chemical reactants, and physical hazards. Emergency responders require a high degree of training not only in their official duties (e.g., firefighting, emergency medicine, investigation), but also in the proper methods for the protection of their personal safety and health. The majority of emergency responders are volunteers for local public agencies that are responsible for their safety and training. The state Public Employees Occupational Safety and Health (PEOSH) Act has adopted the provisions of the OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) for public employers. After a major emergency response, it is prudent to evaluate compliance with the important provisions of this standard.

The event in Lodi raised concerns about the safety of chemical facilities located in dense urban areas. While an analysis of this question is outside the scope of this report, the Napp Technologies incident should remind communities, workers, and their governments of the importance of safety in industrial operations and of proper preparedness. In particular, Local Emergency Preparedness Committees (LEPCs) should be utilized to maintain familiarity with chemicals in use at commercial facilities within municipal jurisdictions.

Shortly after the Napp explosion and fire, the New Jersey Department of Health and Senior Services (NJDHSS) undertook a series of public health investigations and other activities to address these concerns. First, in cooperation with the Bergen County Department of Health Services (BCDHS) and the Hackensack Medical Center (HMC), a medical records survey was conducted to determine the number of persons who sought medical attention for problems experienced during or in the weeks following the fire, and to assess the nature of their health complaints (Section 2). Second, the NJDHSS conducted a survey of all identified emergency responders to assess the frequency of symptoms experienced and the kinds of personal protective equipment employed (Section 3). Third, the NJDHSS is cooperating with the University of Medicine and Dentistry of New Jersey (Section 4) in a study of the long term respiratory health effects among those who experienced acute respiratory effects during the fire. NJDHSS is also assisting in the continued preparedness and safety of emergency response units (Section 6).

Figure 1-1. Approximate extent of plume from Napp Technologies fire.



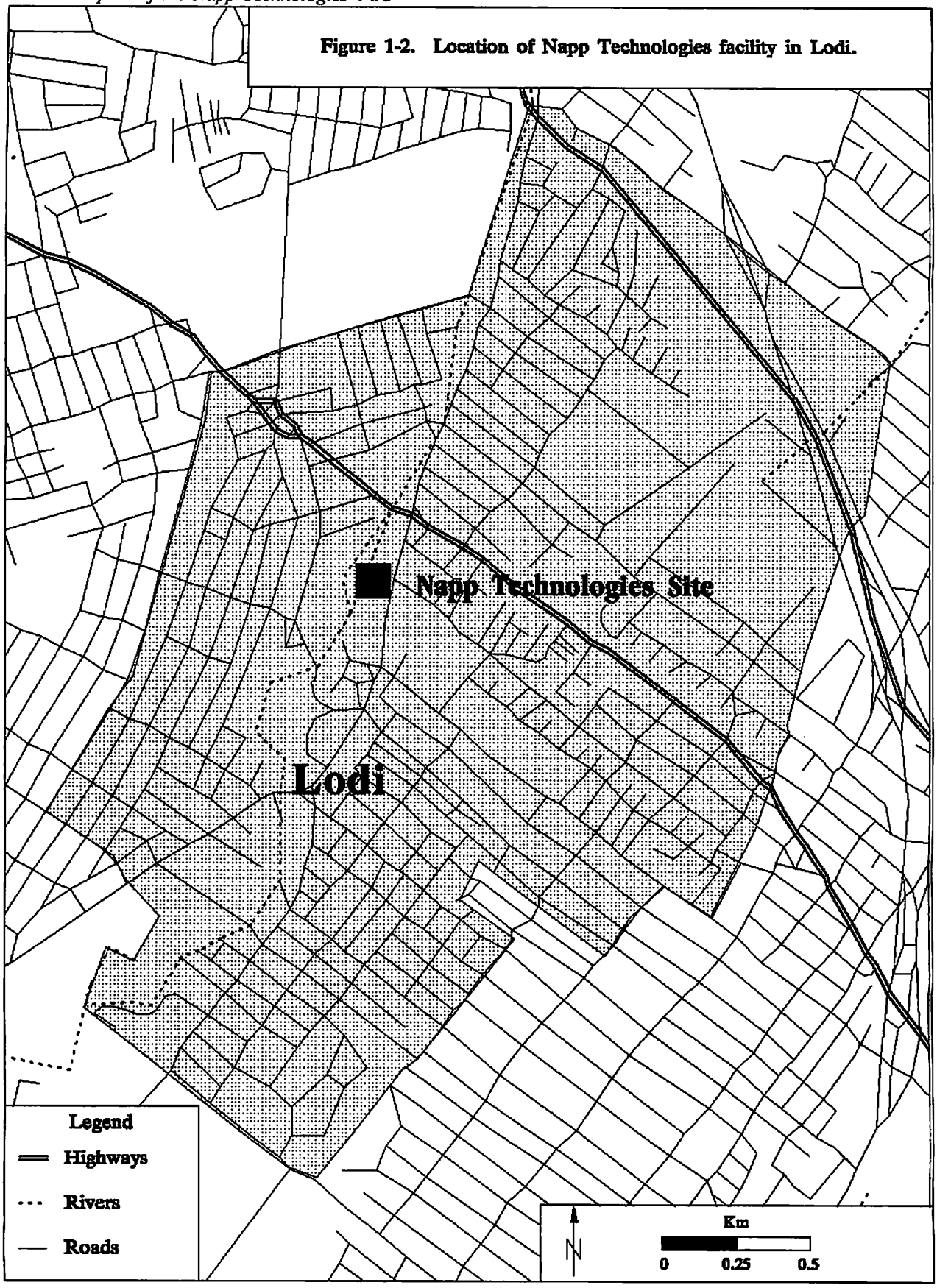


Figure 1-2. Location of Napp Technologies facility in Lodi.

2. Medical Records Abstraction

2.1. Objectives

* To assess the number of individuals presenting for emergency medical care at the Hackensack Medical Center (HMC) emergency department with complaints attributed to the Napp Technologies explosion and fire in the period April 21 to May 9, 1995; to describe these individuals, their reported symptoms, examination findings, medical tests, treatments received, and diagnoses.

* To assess the number of individuals referred for non-emergency care and examined by HMC physicians in the period May 10 to June 2, 1995; to describe these individuals, their reported symptoms, examination findings, medical tests, treatments received, and diagnoses.

2.2. Methods

The Bergen County Department of Health Services (BCDHS) contacted the Hackensack Medical Center (HMC) for permission to review medical records of individuals presenting at the HMC emergency room from the time of the explosion at Napp Technologies through May 9, 1995. HMC medical records staff performed a preliminary sorting of the files to identify candidate patients whose hospital visit may have been related to the Napp Technologies incident.

Additional patient records from the period May 10 through June 21, 1995 were abstracted by BCDHS staff from physicians comprising a referral network set up by HMC to examine individuals concerned about exposure to smoke or vapors from the Napp event. BCDHS staff made contact with each physician to obtain permission to review the records.

No medical records were photocopied or removed from the HMC or physicians' offices.

To standardize the collection and abstraction of information, NJDHSS staff prepared an abstraction form (Appendix B). BCDHS staff completed one form for each patient in each time period and forwarded the forms to the Senior Assistant Commissioner of NJDHSS. To protect the confidentiality of the HMC patient records, personal identifying information was limited to a detachable stub on the first page of the form. This stub, which also contained a unique study number linking it to the remainder of the form, was removed upon receipt at the NJDHSS and stored in a locked cabinet. The NJDHSS staff reviewing and analyzing these forms did not have access to the personal identifying information.

The BCDHS staff abstracted the following information from the medical records:

* the source of the record
* the date the patient was seen
* the patient's age, race and sex
* risk group: whether the patient was a Napp employee, an employee of a nearby business, an emergency responder, or a nearby resident
* the duration of exposure, if recorded
* reported symptoms, with emphasis on acute respiratory effects
* physical findings
* treatments administered
* diagnostic tests conducted
* the patient's pre-existing medical conditions and smoking history, and
* the physician's diagnoses.

The NJDHSS entered all information from the abstraction forms into a computer database for analysis. The original forms are stored in a locked cabinet. The focus of the analysis consisted of cross-tabulation of reported symptoms, examination findings, and physicians' diagnoses by risk group and by time period. To protect confidentiality, details are not reported for risk groups with less than five individuals in a given time period.

2.3. Results

April 21 to May 9, 1995

A total of 53 individuals received medical attention at the Hackensack Medical Center in the period April 21 through May 9, 1995, nearly half (24) being emergency responders. Ten individuals were Napp Technologies employees, including one who later died from injuries suffered in the explosion and fire. The four other individuals who were killed by the blast died at the scene and are not included in these statistics. Fourteen residents were seen in the HMC emergency center. Most of the patients were male and white. Emergency responders were typically younger than the other risk groups (Table 2-1).

All of the Napp employees and the majority of emergency responders who received emergency care at HMC were seen on April 21 or April 22 (Table 2-2). Several emergency responders and almost half of the nearby residents and workers who reported exposure and sought medical attention at the HMC emergency center did so more than ten days after the incident.

Symptoms The most common recorded respiratory symptoms were, in order, cough, chest tightness, sore throat, and wheezing or shortness of breath (Table 2-3). Headache was also reported frequently. The frequencies of reported symptoms were in similar proportion for Napp employees, emergency responders and nearby residents. "Other symptoms" noted by BCDHS staff included nausea, vomiting and dizziness.

Physical Examination HMC emergency center physicians commonly recorded high pulse and respiration rates in all risk groups (Table 2-4). Upper respiratory tract irritation and lung wheeze were also noted frequently. Several Napp employees showed signs of emotional distress from the trauma they experienced.

Tables 2-5, 2-6, and 2-7 summarize the treatments administered to emergency center patients, abnormal diagnostic tests, and recorded pre-existing medical condition, respectively. Oxygen was administered to over half of the emergency responders and nearly all of the Napp

workers seen at the HMC. All of the Napp employees and nearly half of the emergency responders had abnormal results of arterial blood gases.

Physician Diagnoses A large proportion of emergency responders seen at the HMC emergency center were diagnosed with smoke inhalation, and nearly a third were considered to have suffered an episode of asthma or reactive airways dysfunction syndrome (RADS) (Table 2-8). A similar large proportion of residents were diagnosed with respiratory effects from inhalation of smoke or toxic vapors. Diagnoses differed for Napp employees, with burns and abrasions or contusions being most commonly recorded.

May 10 to June 21, 1995

The HMC referral network physicians saw 132 patients in the period May 10 to June 21, 1995, most (115) being emergency responders (Table 2-1). Some of these individuals may have been previously seen in the period April 21 through May 9. The residents that were seen represented a broad cross section of ages. In contrast, most emergency responders were in the 20 to 39 year age group. While most emergency responders were male, forty percent of nearby residents who sought medical attention were female.

Symptoms The pattern of recorded symptoms for patients seen in this time period was not unlike that recorded for the earlier period (Table 2-3). Cough, sore throat and shortness of breath were the most common respiratory symptoms. Headache and skin rash were also frequently reported.

Physical Examination High respiratory rates were observed in patients seen in this period (Table 2-4). A large proportion of patients also were found to have lung wheeze and upper respiratory tract irritation.

As with the earlier period, treatments, abnormal diagnostic tests, and pre-existing conditions are summarized in Tables 2-5 through 2-7. Emergency responder patients seen in this period were more likely to receive antibiotic treatment than in the earlier period.

Physician Diagnoses As in the earlier period, smoke inhalation and asthma or RADS were commonly diagnosed among emergency responders (Table 2-8). In addition, diagnoses of upper respiratory irritation, infection or inflammation were recorded frequently in both emergency responders and nearby residents.

2.4. Discussion

The Napp Technologies explosion and fire caused the death of five employees of the facility. Nine other Napp employees, 16 emergency responders, and six residents were taken to the HMC emergency center for medical attention and treatment during the immediate response to the event. Several emergency responders, nearby residents, and employees of nearby businesses sought medical attention at the HMC emergency center shortly thereafter.

Of course, Napp Technologies employees, emergency responders, and nearby populations experienced the event differently, as evidenced by the nature of the injuries and reported symptoms. Some Napp employees suffered direct effects of the blast and fire, resulting in burns, trauma and death. Some emergency responders and, to a lesser degree, nearby employees and residents experienced acute respiratory effects from inhalation of smoke and vapors from the burning facility.

In its review of the medical records, BCDHS staff noted that diarrhea seemed to be common one or two days after the event, and speculated that this may have been related to chemical exposure, stress, or food-borne pathogen exposure.

The medical records abstraction conducted by the BCDHS was limited to the HMC emergency center and its referral network established in response to this event. While the HMC was the principal medical center involved with this emergency event, other area hospitals may have seen patients with complaints related to the fire and smoke. The number of residents who sought attention from their personal physician is not known. In addition, one of the referral network physicians who saw 15 to 20 patients did not allow access to their records. Therefore, the statistics reported here may underestimate the numbers of affected persons, but

likely are representative of the nature of the health impact.

The health impact of this event appears similar in scope to one which occurred in Thetford, England in 1991, in which 630 emergency responders fought a major fire at a plastics manufacturing plant in a populated part of the town. During the four-day event, 46 emergency responders were treated at a local hospital. The most frequent symptoms were skin irritation, breathing difficulties (chest tightness), sore throat, cough and headache. A follow-up investigation of patient consultations with physicians revealed that seven nearby residents sought medical attention after the fire, primarily for chest tightness or skin irritation (Baxter et al., 1995).

Table 2-1. Demographic characteristics by risk group and time period.

Characteristic		Risk Group				
		Napp Employees	Nearby Workers	Emergency Responders	Nearby Residents	Not Known
April 21 to May 9, 1995						
	Total	10	2*	24	14	3*
Age (years)	<20	0		3	2	
	20-39	3		14	6	
	40-59	6		7	5	
	60-79	1		0	1	
	≥80	0		0	0	
Sex	Female	0		4	5	
	Male	10		20	9	
Race	Black	4		0	1	
	White	2		21	12	
	Other/Unknown	4		3	1	
May 10 to June 21, 1995						
	Total	1*	8	105	15	3*
Age (years)	<20		0	1	3	
	20-39		1	77	3	
	40-59		7	22	2	
	60-79		0	5	6	
	≥80		0	0	1	
Sex	Female		1	2	6	
	Male		7	103	9	
Race	Black		3	0	0	
	White		4	72	10	
	Other/Unknown		1	33	5	

* Details are not provided for risk groups with less than five individuals.

Table 2-2. Exposure characteristics and date of physician examination by risk group and time period.

Characteristic		Risk Group				
		Napp Employees	Nearby Workers	Emergency Responders	Nearby Residents	Not Known
April 21 to May 9, 1995						
Total		10	2*	24	14	3*
Reported Exposure		6		23	10	
Location	At Napp fire	6		11	0	
	At work, not Napp	0		0	1	
	At home	0		0	6	
	Directing traffic	0		3	0	
	Other/Not reported	4		10	7	
Exposure Date	4/21/95	7		20	8	
	4/25/95	0		0	0	
	Not reported	3		4	6	
Date Examined	4/21/95	9		12	4	
	4/22/95	1		3	2	
	4/24/95	0		1	0	
	4/25/95	0		0	0	
	4/26 to 5/2/95	0		1	2	
	5/3 to 5/9/95	0		6	6	
	Not reported	0		1	0	
May 10 to June 21, 1995						
Total		1*	8	105	15	3*
Reported Exposure			8	104	13	
Location	At Napp fire		0	88	1	
	At work, not Napp		7	0	1	
	At home		0	0	3	
	Directing traffic		0	2	0	
	Other/Not reported		1	15	10	
Exposure Date	4/21/95		8	101	13	
	4/25/95		0	2	0	
	Not reported		0	2	2	
Date Examined						
	5/10 to 5/13/95		1	13	1	
	5/14 to 5/22/95		3	43	6	
	5/21 to 5/27/95		4	14	3	
	5/28 to 6/3/95		0	19	2	
	6/4 to 6/10/95		0	1	1	
	6/11 to 6/17/95		0	13	0	
	6/18 to 6/25/95		0	1	0	
	Not reported		0	1	2	

* Details are not provided for risk groups with less than five individuals.

Table 2-3. Reported symptoms by risk group and time period.

Note: Columns may sum to more than total number in group due to multiple symptoms in some individuals.

Symptom	Risk Group				
	Napp Employees	Nearby Workers	Emergency Responders	Nearby Residents	Not Known
April 21 to May 9, 1995					
Total	10	2*	24	14	3*
Irritated Eyes	0		2	3	
Tearing Eyes	0		0	1	
Blurred Vision	0		0	1	
Skin Rash	0		1	2	
Headache	0		7	3	
Nasal Congestion	0		0	2	
Runny Nose	0		2	0	
Shortness of Breath	0		1	4	
Sore Throat	1		6	2	
Wheezing	0		4	1	
Cough	2		12	1	
Chest Tightness	3		6	4	
Other Symptoms	8		13	8	
No Symptoms	1		0	0	
May 10 to June 21, 1995					
Total	1*	8	105	15	3*
Irritated Eyes		0	8	2	
Tearing Eyes		0	3	1	
Blurred Vision		0	0	0	
Skin Rash		0	15	0	
Headache		4	29	1	
Nasal Congestion		0	10	1	
Runny Nose		1	3	0	
Shortness of Breath		3	13	4	
Sore Throat		2	53	5	
Wheezing		1	8	2	
Cough		1	36	7	
Chest Tightness		0	13	0	
Other Symptoms		3	56	6	
No Symptoms		2	16	1	

* Details are not provided for risk groups with less than five individuals.

Table 2-4. Reported physical examination findings by risk group and time period.

Note: Columns may sum to more than total number in group due to multiple findings in some individuals.

Examination Finding	Risk Group				
	Napp Employees	Nearby Workers	Emergency Responders	Nearby Residents	Not Known
April 21 to May 9, 1995					
Total	10	2*	24	14	3*
URT Irritation**	0		2	4	
Tachycardia	2		6	2	
Lung Wheeze	1		6	1	
High Respiration Rate	8		17	8	
Cyanosis	0		0	0	
Fatigue, Distress	3		0	2	
Other Finding	5		3	3	
May 10 to June 21, 1995					
Total	1*	8	105	15	3*
URT Irritation**		0	9	1	
Tachycardia		0	3	1	
Lung Wheeze		0	11	3	
High Respiration Rate		1	52	3	
Cyanosis		0	0	0	
Fatigue, Distress		1	3	1	
Other Finding		0	3	1	

* Details are not provided for risk groups with less than five individuals.

** URT = Upper Respiratory Tract

Table 2-5. Reported treatments by risk group and time period.

Note: Columns may sum to more than total number in group due to multiple treatments in some individuals.

Treatment	Risk Group				
	Napp Employees	Nearby Workers	Emergency Responders	Nearby Residents	Not Known
April 21 to May 9, 1995					
Total	10	2*	24	14	3*
Eye Drops	2		2	2	
Oxygen	9		14	4	
Antibiotics	4		3	0	
Bronchodilator	0		3	0	
Intravenous Fluids	3		0	0	
Corticosteroids	0		5	0	
Sedatives	2		0	0	
Other Treatment	6		7	5	
No Treatment	0		2	5	
May 10 to June 21, 1995					
Total	1*	8	105	15	3*
Eye Drops		0	0	0	
Oxygen		0	0	1	
Antibiotics		0	16	2	
Bronchodilator		1	9	4	
Intravenous Fluids		0	0	1	
Corticosteroids		1	10	5	
Sedatives		0	0	0	
Other Treatment		1	26	3	
No Treatment		7	73	9	

* Details are not provided for risk groups with less than five individuals.

Table 2-6. Reported abnormal diagnostic tests by risk group and time period, expressed as number with abnormal test over the number reported tested.

Diagnostic Test	Risk Group				
	Napp Employees	Nearby Workers	Emergency Responders	Nearby Residents	Not Known
April 21 to May 9, 1995					
Total	10	2*	24	14	3*
Complete Blood Count	4/4		6/9	3/4	
Arterial Blood Gases	3/3		7/11	3/5	
Carboxyhemoglobin	0/3		1/10	0/3	
Peak Respiratory Flow	0/0		0/0	0/0	
Pulmonary Function	0/0		3/6	1/2	
Chest X-ray	1/6		1/16	0/6	
Other	6/7		3/13	3/5	
May 10 to June 21, 1995					
Total	1*	8	105	15	3*
Complete Blood Count		0/8	18/94	1/3	
Arterial Blood Gases		0/3	2/19	1/1	
Carboxyhemoglobin		0/1	0/0	0/0	
Peak Respiratory Flow		0/3	0/5	0/1	
Pulmonary Function		1/8	18/94	2/4	
Chest X-ray		0/7	9/97	2/5	
Other		3/5	40/91	3/3	

* Details are not provided for risk groups with less than five individuals.

Table 2-7. Reported pre-existing conditions by risk group and time period, expressed as number with condition over the number with a response.

Condition	Risk Group				
	Napp Employees	Nearby Workers	Emergency Responders	Nearby Residents	Not Known
April 21 to May 9, 1995					
Total	10	2*	24	14	3*
Allergies	1/7		3/24	3/12	
Asthma	0/9		2/23	1/12	
Emphysema	0/9		0/24	0/12	
Other Lung Condition	0/9		0/24	0/12	
Other Medical Condition	2/8		1/22	4/10	
Current Smoker	1/5		3/20	2/11	
May 10 to June 21, 1995					
Total	1*	8	105	15	3*
Allergies		1/8	24/103	4/15	
Asthma		0/8	8/101	2/14	
Emphysema		0/8	0/101	0/14	
Other Lung Condition		0/8	3/100	2/14	
Other Medical Condition		3/8	11/85	3/9	
Current Smoker		3/7	24/73	4/13	

* Details are not provided for risk groups with less than five individuals.

Table 2-8. Diagnoses by risk group and time period.

Note: Columns may sum to more than total number in group due to multiple diagnoses in some individuals.

Diagnosis	Risk Group				
	Napp Employees	Nearby Workers	Emergency Responders	Nearby Residents	Not Known
April 21 to May 9, 1995					
Total	10	2*	24	14	3*
No diagnosis	0		0	1	
Smoke/Toxic Inhalation	1		18	9	
URTI**	0		3	4	
LRTI***	0		1	1	
Asthma/RADS****	0		7	0	
COPD*****/Emphysema	0		0	0	
Eye Irritation/Conjunctivitis	0		2	0	
Abrasion/Contusion	5		1	0	
Abdominal Upset	1		1	2	
Skin Irritation/Dermatitis	0		1	1	
Skin Burn	4		0	0	
Other	2		0	1	
May 10 to June 21, 1995					
Total	1*	8	105	15	3*
No diagnosis		5	6	2	
Smoke/Toxic Inhalation		1	82	0	
URTI**		1	22	6	
LRTI***		0	3	2	
Asthma/RADS****		1	36	4	
COPD*****/Emphysema		0	0	1	
Eye Irritation/Conjunctivitis		0	0	1	
Abrasion/Contusion		0	0	0	
Abdominal Upset		0	2	0	
Skin Irritation/Dermatitis		0	6	0	
Skin Burn		0	0	0	
Other		0	3	4	

* Details are not provided for risk groups with less than five individuals.
** URTI = Upper respiratory tract infection, inflammation or irritation
*** LRTI = Lower respiratory tract infection, inflammation or irritation
**** RADS = Reactive airways dysfunction syndrome
***** COPD = Chronic obstructive pulmonary disease

3. Emergency Responder Survey

3.1. Objective

* To collect information from individuals who responded to the Napp Technologies explosion and fire regarding health symptoms experienced during the fire, duties performed, and personal protection equipment worn.

3.2. Methods

NJDHSS staff contacted local emergency management centers to obtain lists of agencies that were on-scene in response to the Napp Technologies event. There were three major categories of emergency responder: firefighters, police officers, and emergency medical technicians (EMTs). Other personnel reported to be on-scene included those from other governmental agencies and from private aid organizations. NJDHSS identified and contacted 113 emergency responder agencies reported to be on-scene. A list of these agencies can be found in Appendix A.

Survey Instrument

NJDHSS staff developed an Emergency Event Responder Questionnaire (Appendix C) which was intended to gather the following information from emergency responders:

* the responder's age, sex and volunteer/career status
* symptoms experienced within 48 hours of being on duty at the Napp scene
* the date and location of medical attention received
* job duties performed during the two days following the event
* personal protective equipment worn during the same period

Specific information on job duties and personal protective equipment worn was gathered

for each of five time periods: 8:00 a.m. to 12:00 noon on April 21, 12:00 noon to 6:00 p.m. on April 21, 6:00 p.m. to 12:00 midnight on April 21, 12:00 midnight to 8:00 a.m. on April 22, and 8:00 a.m. to 6:00 p.m. on April 22.

Minor variants of the questionnaire were prepared for each of the major categories of emergency responders to reflect the job duties typically conducted (Appendix C).

Questionnaires were sent to each emergency responder identified through the procedures described below. A cover letter stating the purpose of the questionnaire (and criteria for participation in the Clinical Study described in Section 4) was sent with the survey form to all individuals contacted.

Fire Departments

NJDHSS sent a letter to the Fire Chiefs of each identified fire department requesting a list of names and addresses of individuals from their Departments who were on-scene at the fire. A total of 32 fire companies were contacted. As needed, this initial letter was followed up with telephone calls and fax messages to remind the Fire Chiefs to forward their list to NJDHSS.

After a list was obtained, each department was assigned a code number and the names and addresses of individuals including their titles were entered into a database. To protect and maintain the confidentiality of survey respondents, a case number that incorporated the department code was also assigned to each individual. Mailing labels were generated for sending the survey questionnaire with a self-addressed paid envelope to each individual. From the fire departments, 647 firefighters were identified and contacted.

Police Departments

NJDHSS obtained a list of police personnel on-scene at the Napp event, representing 39 police departments, from the Bergen County Police Chiefs Association. These individuals were also assigned a case number and their identifying information was data entered. Again, each individual was sent a survey form with a self-addressed paid envelope. From the list, 120

police personnel were identified and contacted.

Emergency Medical Service Squads

Because of the lengthy process required to obtain the names of individuals from the fire and police departments, Captains of the 35 emergency medical service (EMS) squads, identified by Northern New Jersey Mobile Intensive Care Communications Services, were sent a packet with the following: 1) a form to indicate whether or not their unit was on-scene and the names of individuals involved, and 2) a supply of survey forms to distribute to those individuals. Self-addressed paid envelopes were included for the return of the completed questionnaires.

Other Agencies

The same procedure used to contact EMS squads was followed for the following ten agencies reported to be on-scene at Napp Technologies: the Bergen County Department of Health Services, the Bergen County Prosecutors' Office, Bergen County's Office of the Sheriff, the American Red Cross, the Passaic Valley Sewerage Commissioners, the New Jersey State Police, the New Jersey Department of Environmental Protection, the New Jersey Department of Transportation, the federal Occupational Safety and Health Administration, and the U.S. Environmental Protection Agency.

Individuals were asked to return their completed forms within two weeks of receipt. Finally, a mass mailing was conducted to all contact persons in each agency to remind their personnel to send their completed forms. Completed forms were collected by the NJDHSS Occupational Disease and Injury Services and forwarded to Consumer and Environmental Health Services for data management and analysis.

Data from questionnaires were coded and entered into a computer file. Jobs duties were then grouped into three exposure categories -- high, medium and low -- according to potential for exposure to smoke and toxic inhalation hazards, as judged by industrial hygienists. High exposure potential job duties included hose line operator, ventilation, primary search, and entry team (or equivalent duties). Medium exposure potential jobs included pump operator, overhaul, and investigation (including body removal). All other job duties were included in the low

exposure potential category. Similarly, different forms of personal protective equipment were grouped into three categories according to the degree of respiratory protection afforded. These categories included high, medium, and none. The high category of respiratory protection included turn-out gear with air pack, Level A, and Level B. The medium category included Level C and respirator (or equivalent terms). For analysis, the two April 22 time periods were collapsed into one.

Each individual was assigned a job exposure potential score and a personal protective equipment score for each time period on duty. Many emergency responders performed multiple job duties and wore different corresponding personal protective equipment within one time period. For the purposes of this analysis, the time period scores were based on the most exposed job duty and the highest level of personal respiratory protection. In addition, an overall job exposure potential score and personal protective equipment score was assigned to each person, also corresponding to the job duty with greatest exposure potential and the most protective equipment worn during the Napp Technologies event.

The frequency of symptoms self-reported on questionnaires was examined for each major category of emergency responder, job exposure potential, and by degree of personal respiratory protection. These analyses were considered for each time period and overall. Each symptom was considered separately. In addition, two groupings of symptoms were used to define a probable case of acute respiratory illness. The first group was a strict case definition, and included only those persons reporting wheezing, chest tightness or shortness of breath. The second, looser case definition included persons reporting any of those three symptoms, nasal congestion, or cough.

3.3. Results

Survey Population

NJDHSS received a total of 505 completed questionnaires from emergency responders. (This figure does not include three duplicate responses from persons serving dual roles who completed separate forms. Their responses were combined into one computer record each.)

Of the 647 firefighters contacted, 279 (43%) returned completed survey forms. Of the 120 police personnel contacted, 66 (55%) replied. Denominators are not known for EMTs and other agency personnel, so response proportions cannot be reported. However, 67 EMTs and 89 individuals from other agencies responded to the survey. Four persons returned surveys but could not be linked with any known agency. The demographic characteristics of the emergency responders who returned survey forms are summarized in Table 3-1.

Twenty-two emergency responders reported having sought medical attention at a hospital emergency room (a figure comparable to the 24 emergency responders for whom medical records were abstracted from the Hackensack Medical Center emergency center). Most were firefighters (14), while five EMTs and 3 police personnel also reported emergency care.

Most of the emergency responders (411 of 505, or 81%) reported seeking no medical care as a result of the Napp Technologies fire, including 83% of police personnel, 87% of EMTs, and 96% of other agency personnel. Approximately three-quarters (209 of 279) of firefighters reported no medical attention.

Time Period, Exposure and Personal Protective Equipment

Based on the emergency responders returning surveys, the highest number of emergency responders (383, including 88 firefighters) were on scene at the Napp Technologies fire between 12:00 noon and 6:00 pm on April 21. A total of 287 emergency responders, including 78 firefighters, were on scene from 8:00 am to 12:00 noon on April 21, and 281 responders, including 30 firefighters, were on scene from 6:00 pm to midnight on April 21. On April 22, 165 emergency responders were on scene. (Because of incomplete response proportions, these figures are underestimates of the actual numbers on scene.)

The distribution of emergency responders by job exposure potential category for each time period is found in Table 3-2. Over 40% of the firefighters returning surveys reported a high exposure category job at least once during the event. As would be expected, the greatest number of firefighters were engaged in high exposure potential job duties during the first ten

hours after the beginning of the event. A small proportion of other emergency responders were grouped into the high and medium exposure potential categories, mostly in relation to search and investigatory responsibilities.

The distribution of emergency responders by reported personal protective equipment category is found in Table 3-3. In general, the pattern of personal respiratory protection equipment use mirrored the pattern of job exposure category.

Symptom Frequency

The most commonly reported symptoms experienced within 48 hours of being on-scene at Napp Technologies were headache (37%), sore throat (35%), eye irritation (28%), cough (26%), and nasal congestion (19%). A large proportion (39%) reported experiencing no symptoms. Table 3-4 contains the number of persons reporting selected symptoms, by emergency responder category. While the same symptoms were most common in each group, symptoms were less frequent in the "other" responder category than in firefighters, police and EMTs. Approximately 20% of firefighters, police and EMTs reported symptoms meeting the stricter case definition, while nearly half of firefighters and one-third of police and EMTs met the looser case definition.

The frequency of reported symptoms by job exposure category is found in Table 3-5. The same symptoms were most common in each group (headache, sore throat, irritated eyes, cough and nasal congestion). However, the frequency of symptoms was most common in the high job exposure potential category compared to frequencies in the medium and low categories. About one-third of the persons in the high exposure potential category met the strict case definition, and nearly two-thirds met the looser one, both proportions higher than in the medium and low exposure groups. One-half of the low exposure potential group, one-third of the medium group, and one-sixth of the high group reported experiencing no symptoms.

Symptom frequencies by reported personal protective equipment category are found in Table 3-6. The results for this comparison parallel that for the job exposure categories.

Symptom frequencies for personal protective equipment were also examined within each job exposure category and by time period. In general, no differences were observed in symptom frequencies, but the comparison was limited due to small numbers of individuals with either high exposure and medium or no personal protection, and low exposure potential and medium or high personal protection.

3.4. Discussion

The results of the emergency responder survey show that, among those returning questionnaires, approximately 60% experienced one or more symptom, including headache, eye irritation, skin rash, or respiratory effect. Twenty percent of emergency responders reported one or more symptom meeting a strict case definition for acute respiratory problem (wheezing, shortness of breath or chest tightness). Those whose jobs involved the greatest risk of exposure were more likely to experience symptoms meeting the case definition, a finding that underscores the critical importance of continued training and the proper use of personal protective equipment under the difficult conditions of firefighting.

The response proportions from firefighters and police were relatively low. Many factors may account for this low return rate. The NJDHSS sent forms to all individuals listed by their fire or police departments, and some may not have returned forms because they were not actually on scene. For example, certain fire departments with an EMS unit only had their EMTs on-scene and not their firefighting personnel. Others who were on scene may not have responded to the survey because they did not experience any symptoms. If so, the estimates of proportions of emergency responders experiencing symptoms in this report would be overestimates of the true proportions.

Several emergency responders in the "other" category provided unsolicited remarks on their survey forms. In particular, those involved with activities supporting the firefighting, such as heavy equipment operators, expressed a desire for more safety training and protective equipment to be better prepared for emergency operations. Under the provisions of 29 CFR 1910.120, individuals who are likely to be exposed to hazardous materials should be trained

to the appropriate level of competency; appropriate training should be extended to all such workers who may be called upon to provide vital support services in an emergency.

Anecdotal complaints from some emergency responders indicated a lack of information readily available to on-scene emergency responders regarding the nature and quantity of hazardous materials within the burning facility. Consideration should be given to the broader use of improved systems to notify responders, especially those on-scene early in a response, of the hazards they may face. For example, more widespread use of a building placarding system, such as one developed by the National Fire Protection Association, may be particularly useful for conveying key information to emergency responders.

Table 3-1. Demographic characteristics of emergency responders.

Characteristic		Emergency Responder Group				
		Firefighter	Police	EMT	Other	Unknown
Total		279	66	67	89	4*
Age Group (years)	<20	6	0	7	4	
	20-29	97	8	29	20	
	30-39	86	38	17	45	
	40-49	56	15	14	12	
	50-59	22	5	0	6	
	60-69	9	0	0	2	
	70-79	3	0	0	0	
Sex	Female	4	1	18	8	
	Male	275	65	49	81	

* Details are not provided for groups with less than five individuals.

Table 3-2. Distribution of emergency responders by job exposure category and time period.

Time Period and Job Exposure Category*	Emergency Responder Group			
	Firefighter	Police	EMT	Other
Any Time Period				
High	120	0	1	1
Medium	55	4	3	8
Low	104	62	63	50
April 21 8:00 am to 12:00 noon				
High	73	0	1	0
Medium	30	2	0	3
Low	65	26	27	57
April 21 12:00 noon to 6:00 pm				
High	87	0	0	1
Medium	42	3	0	6
Low	71	51	50	69
April 21 6:00 pm to 12:00 midnight				
High	28	0	1	1
Medium	34	3	3	7
Low	81	43	37	43
April 22				
High	24	0	1	0
Medium	29	1	0	6
Low	47	14	12	29

* High: Hose line operator, ventilation, primary search, or entry team
Medium: Pump operator, overhaul, or investigation
Low: Other jobs

Table 3-3. Distribution of emergency responders by reported use of personal respiratory protective equipment and time period.

Time Period and Personal Protection Category*	Emergency Responder Group			
	Firefighter	Police	EMT	Other
Any Time Period				
High	127	2	3	9
Medium	35	0	3	0
None	117	64	61	80
April 21 8:00 am to 12:00 noon				
High	76	1	1	6
Medium	23	0	3	0
None	69	27	24	54
April 21 12:00 noon to 6:00 pm				
High	101	1	2	8
Medium	22	0	2	0
None	77	53	46	86
April 21 6:00 pm to 12:00 midnight				
High	37	1	1	7
Medium	25	0	0	0
None	81	45	40	44
April 22				
High	17	0	1	3
Medium	17	0	0	0
None	66	15	12	32

* High: Turn-out gear with air pack, Level A, or Level B
Medium: Level C or air-purifying respirator
None: None of the above

Table 3-4. Frequency of (percent with) reported symptoms, and symptoms meeting case definitions, by emergency responder group.

Symptom	Emergency Responder Group			
	Firefighter	Police	EMT	Other
Total	279	66	67	89
Irritated/burning eyes	72 (26)	28 (42)	19 (28)	19 (21)
Skin rash	35 (13)	2 (3)	7 (10)	1 (1)
Headache	103 (37)	29 (44)	27 (40)	26 (29)
Nasal Congestion	59 (21)	13 (20)	13 (19)	13 (15)
Sore or dry throat	103 (37)	24 (36)	22 (33)	23 (26)
Shortness of breath	26 (9)	5 (8)	2 (3)	5 (6)
Wheezing	30 (11)	9 (14)	5 (7)	6 (7)
Cough	91 (33)	16 (24)	16 (24)	10 (11)
Chest tightness	32 (11)	9 (14)	11 (16)	3 (3)
Case definition I*	58 (21)	13 (20)	12 (18)	8 (9)
Case definition II*	128 (46)	22 (33)	22 (33)	20 (22)
No symptoms	99 (35)	25 (38)	28 (42)	46 (52)

* Case definition I: Wheezing, shortness of breath or chest tightness
Case definition II: Wheezing, shortness of breath, chest tightness, nasal congestion or cough

Table 3-5. Frequency of (percent with) reported symptoms, and symptoms meeting case definitions, by job exposure category.

Symptom	Job Exposure Category		
	High	Medium	Low
Total	122	70	313
Irritated/burning eyes	47 (39)	15 (21)	78 (25)
Skin rash	25 (20)	6 (9)	14 (4)
Headache	59 (48)	26 (37)	103 (33)
Nasal Congestion	37 (30)	16 (23)	45 (14)
Sore or dry throat	62 (51)	22 (31)	91 (29)
Shortness of breath	22 (18)	2 (3)	14 (4)
Wheezing	22 (18)	2 (3)	26 (8)
Cough	52 (43)	23 (33)	58 (19)
Chest tightness	23 (19)	5 (7)	27 (9)
Case definition I*	42 (34)	7 (10)	42 (13)
Case definition II*	77 (63)	27 (39)	88 (28)
No symptoms	21 (17)	23 (33)	155 (50)

* Case definition I: Wheezing, shortness of breath or chest tightness
Case definition II: Wheezing, shortness of breath, chest tightness, nasal congestion or cough

Table 3-6. Frequency of (percent with) reported symptoms, and symptoms meeting case definitions, by personal respiratory protective equipment use category.

Symptom	Personal Protective Equipment Category		
	High	Medium	None
Total	141	39	325
Irritated/burning eyes	49 (35)	9 (23)	82 (25)
Skin rash	28 (20)	2 (5)	15 (5)
Headache	66 (47)	11 (28)	111 (34)
Nasal Congestion	39 (28)	5 (13)	54 (17)
Sore or dry throat	63 (45)	15 (38)	97 (30)
Shortness of breath	20 (14)	2 (5)	16 (5)
Wheezing	18 (13)	3 (8)	29 (9)
Cough	55 (42)	12 (31)	66 (20)
Chest tightness	21 (15)	1 (3)	33 (10)
Case definition I*	36 (26)	4 (10)	51 (16)
Case definition II*	77 (55)	13 (33)	102 (31)
No symptoms	31 (22)	17 (44)	151 (46)

* Case definition I: Wheezing, shortness of breath or chest tightness
Case definition II: Wheezing, shortness of breath, chest tightness, nasal congestion or cough

4. Clinical Follow-up Study of Respiratory Health Effects

In 1994, the Occupational Health Division of the Department of Environmental and Community Medicine at the University of Medicine and Dentistry/Robert Wood Johnson Medical School (RWJMS) and NJDHSS began a joint study entitled "Bronchial Hyperreactivity Following Acute Inhalation Injury." The NJDHSS and RWJMS agreed to include in this study individuals who experienced respiratory symptoms associated with exposure from the Napp Technologies fire.

The primary objective of the RWJMS-NJDHSS study of individuals exposed at the Napp Technologies fire is to determine the number of individuals who experienced measurable and quantifiable respiratory health effects due to the fire and to determine the severity and persistence of those problems. A second objective of this study is to determine which risk factors, including age, smoking history, or pre-existing health conditions correlate with severity and persistence of symptoms. The third objective of this study is to determine which, if any, medical treatments received by individuals were most effective in preventing persistence of adverse health effects.

Individuals were eligible for inclusion in the study if they were seen by a physician between April 21 and June 2, 1995 with respiratory symptoms due to exposure to smoke resulting from the fire in Lodi. Individuals also had to be at least 18 years of age and residents of New Jersey. Subjects for the clinical study were recruited from individuals exposed at the fire as follows:

Study Group 1: This group includes EMTs, firefighters, police officers, and individuals from other agencies who were known to be at the fire, who completed the Emergency Event Responder Questionnaire described in Section 3, and met the eligibility criteria for inclusion in the study.

Study Group 2: This group includes individuals who were seen in the emergency

center of the Hackensack Medical Center (HMC), or the physician referral network established by the HMC, because of respiratory symptoms related to the fire.

Individuals who agree to participate in the study will receive a free medical evaluation of their respiratory system. The RWJMS will not provide medical treatment. With the participant's permission, the physician from the RWJMS will send results of the evaluation to the patient's personal physician. The results of medical examinations will be confidential. When the study is completed, the information collected from participants will be compiled and summarized in a statistical report.

5. Conclusions

The Napp Technologies explosion and fire on April 21, 1995, in Lodi, N.J., was a major emergency event. Hundreds of firefighters, police officers, emergency medical service technicians, and support service providers from local, state and federal agencies were needed to bring the fire under control.

Five Napp Technologies workers died as a result of injuries suffered in the blast and fire, and nine others were treated at the Hackensack Medical Center (HMC). A review of medical records by the Bergen County Department of Health Services and the NJDHSS showed that sixteen emergency responders were treated at the HMC during the five day period following the explosion (April 21 to 25) and seven more sought emergency care in the next two weeks. Nine nearby residents, workers at nearby businesses, or others also sought emergency medical attention in the first five days, and ten more sought emergency care in the following two weeks.

The full public health impact of the event is not measured by these statistics alone. The NJDHSS medical records survey was restricted to conditions requiring acute medical care. A much larger, unmeasured number of community residents may have suffered symptoms related to low level exposure to smoke from the fire not requiring emergency care.

Over 500 hundred emergency responders participated in an NJDHSS survey. The results of the survey show that over 300, or approximately 60% of participating emergency responders, experienced one or more symptom. The most common symptoms were headache, sore throat, eye irritation, cough, and nasal congestion. Twenty percent of emergency responders reported one or more symptoms meeting a strict case definition for acute respiratory problem (wheezing, shortness of breath or chest tightness). Emergency responders whose job duties involved the greatest risk of exposure were more likely to experience symptoms meeting the strict case definition.

In view of the frequency of reported respiratory symptoms among emergency responders, the adequacy of worker training programs in hazardous materials and personal protective equipment use (particularly air purifying and supplied air respirators) should be continually examined and updated. Additionally, the response to the emergency event involved supportive efforts by groups of workers not usually considered "emergency responders" such as public sector heavy equipment operators expected to respond to uncontrolled releases of hazardous substances. Training in hazardous materials management and personal protective equipment may not be adequate for these workers. Existing training courses designed for the protection and safety of emergency responders, such as those offered by the New York/New Jersey Hazardous Materials Worker Training Center, should be extended to workers who provide support to emergency responders during events such as the one in Lodi.

To further protect the safety of emergency responders and nearby communities, there is a need for effective systems for on-scene notification of hazardous materials likely to be faced by emergency responders, particularly those who are first on-scene. Consideration should be given to broader use of a building placarding system such as the one developed by the National Fire Protection Association, so that key hazard information is conveyed to emergency responders in an appropriately timely manner.

6. Public Health Action Plan

6.1. Actions Completed

Assessment of Health Impact

This report summarizes the efforts of the Bergen County Department of Health Services and the NJDHSS to assess the numbers of persons affected by the Napp Technologies fire and explosion, to describe the types and frequencies of symptoms and health effects experienced by emergency responders and those seeking medical attention in the aftermath of the event, and to examine reported symptoms among emergency responders with respect to job duties and personal protective equipment used.

Information to Public Employers Involved with the Event Response

The Public Employees Occupational Safety and Health (PEOSH) Program of the NJDHSS conducted a mass mailing in November 1995 to all municipalities identified as having had employees on-scene at the Napp Technologies fire. The mailing was sent to the Mayor, Police and Fire Chiefs, and the individual in charge of emergency medical services (EMS). The mailing included a cover letter and:

* a brochure describing PEOSH,
* the Hazardous Waste and Emergency Response Standard,
* the PEOSH information bulletin on Hazardous Materials Regulations for Emergency Responders,
* the PEOSH model Coordinated Worker Protection Emergency Response Plan,
* the PEOSH model Responding Department Annex, and
* a brief survey on municipal emergency response.

In addition to these materials, the Mayors and Fire Chiefs received copies of the PEOSH Standards for Firefighters and the PEOSH Model Fire Department Respiratory Protection Program. The PEOSH Program also offered each municipality technical assistance in implementing the requirements of the standards cited above.

PEOSH Compliance Inspections

The PEOSH Program conducted inspections of several municipalities to evaluate compliance with section (q) of the Hazardous Waste and Emergency Response Standard (29 CFR 1910.120). Section (q) contains the requirements for hazardous materials response activities. The PEOSH Program also evaluated compliance with the respiratory protection requirements of the PEOSH Standards for Firefighters (NJAC 12:100-10). The PEOSH Program followed standard operating procedures for the conduct of these inspections, which occurred in the period January through April 1996.

The PEOSH Program inspected seven of the municipalities with employees on-scene at the Napp Technologies fire, including Lodi and six selected at random: Secaucus, South Hackensack, East Rutherford, Emerson, River Edge, and Wayne. A minimum of three inspections were conducted in each municipality including the fire and police departments, and the emergency medical services squad. Maywood was not included because the PEOSH Program had recently conducted a similar inspection at the fire department.

A few days before each inspection, the Mayor or highest ranking official of the municipality was contacted. The purpose of this contact was to inform the official that the PEOSH Program would be conducting an inspection and that the municipality should have available the following for review:

* the Emergency Response Plan (ERP) and ERP annexes,
* documentation that employees required to participate in hazardous materials (HazMat) emergencies meet the training and competencies requirements of the Hazardous Waste Operations and Emergency Response Standard,
* a list of HazMat team members (if the municipality has a team),
* the fire department written respiratory protection program, and
* fire department respiratory protection training records, self-contained breathing apparatus (SCBA) inspection records, SCBA maintenance records, firefighter SCBA fit test records, and compressed breathing air quality test results.

The PEOSH Program also requested that the Mayor or equivalent official notify the appropriate personnel (for example, Police and Fire Chiefs, the individual in charge of EMS, and the Emergency Management Coordinator) so that the PEOSH Program inspectors would have access to the workplaces and the opportunity to interview management and union representatives.

Five of the seven municipalities exhibited one or more potential violations of the Hazardous Waste Operations and Emergency Response Standard. Most potential violations were for not developing and implementing an emergency response plan (ERP). (An ERP is designed to protect the health and safety of emergency response workers. In contrast, all inspected municipalities had an emergency operations plan (EOP), which is designed to coordinate emergency response activities for the protection of the environment and the community.) Two municipalities also had potential violations related to the lack of training records. Each of the seven municipalities had at least one potential violation of the PEOSH Standards for Firefighters. Potential violations were for the lack of a written respiratory protection program or for not providing appropriate facepiece fit testing of equipment. A more detailed summary of the findings of these inspections are available from the PEOSH Program of the NJDHSS.

The PEOSH Program has issued written reports to each Mayor with findings of the inspections, recommended actions if any to correct identified inadequacies, and potential violations. The NJDHSS has notified the New Jersey Department of Labor (NJDOL) of the potential violations; upon review, the NJDOL may issue formal citations.

6.2. Actions in Progress

Clinical Follow-up Study

The University of Medicine and Dentistry of New Jersey/Robert Wood Johnson Medical School is conducting a clinical follow-up study of individuals who experienced acute respiratory problems associated with the Napp Technologies event. See Section 4 of this report for a description of the purpose and scope of this study.

6.3. Recommended Future Actions

During a major event such as the Napp Technologies fire and explosion, and the subsequent response by emergency management agencies, the public's health -- including that of site workers, emergency responders, and community members -- is placed at risk. It is imperative to maintain strong prevention efforts, assure emergency response preparedness, and develop capacities for assessment of public health impact in the wake of events like this.

There should be periodic reviews of roles and training needs for the protection and safety of all workers involved in emergency response, as required under the Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). Existing training courses such as those offered by the New York/New Jersey Hazardous Materials Worker Training Center should be extended to workers who provide support to emergency responders during events such as the one in Lodi, including public sector heavy equipment operators.

An effective on-scene notification systems for emergency responders should be implemented so that emergency responders will have readily available information on the nature and quantity of specific hazardous materials within a structure. For example, widespread use of a building placard system that identifies interior hazards, such as the one developed by the National Fire Protection Association, may be useful for conveying key hazard information to emergency responders.

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Appendix A: List of Emergency Responder Agencies

List of Emergency Responder Agencies

FIRE DEPARTMENTS

1. Carlstadt Fire Department
2. East Rutherford Fire Department
3. Edgewater Volunteer Fire Department
4. Elmwood Park Fire Department
5. Englewood Cliffs Fire Department
6. Fair Lawn Fire Department
7. Fairview Fire Department
8. Fort Lee Fire Department
9. Garfield Fire Department
10. Hasbrouck Heights Fire Department
11. Leonia Fire Department
12. Little Ferry Fire Department
13. Mahwah Fire Department
14. Maywood Fire Department
15. Paramus Fire Department
16. North Arlington Fire Department
17. Palisades Park Fire Department
18. Moonachie Fire Department
19. Rochelle Park Fire Department
20. Rutherford Fire Department
21. Saddle Brook Fire Department
22. Teaneck Fire Department
23. Tenafly Fire Department
24. Wallington Fire Department
25. Wood-Ridge Fire Department
26. Secaucus Fire Department
27. Lodi Fire Department
28. Lyndhurst Fire Department
29. Passaic Fire Department
30. Ridgefield Fire Department

POLICE DEPARTMENTS

31. Bergenfield Police Department
32. Carlstadt Police Department
33. Cliffside Park Police Department
34. Closter Police Department
35. Cresskill Police Department
36. Dumont Police Department
37. East Rutherford Police Department

38. Edgewater Police Department
39. Elmwood Police Department
40. Emerson Police Department
41. Englewood Police Department
42. Englewood Cliffs Police Department
43. Fair Lawn Police Department
44. Fairview Police Department
45. Fort Lee Police Department
46. Garfield Police Department
47. Glen Rock Police Department
48. Hackensack Police Department
49. Haworth Police Department
50. Hillsdale Police Department
51. Little Ferry Police Department
52. Lodi Police Department
53. Lyndhurst Police Department
54. Mahwah Police Department
55. Maywood Police Department
56. New Milford Police Department
57. North Arlington Police Department
58. Norwood Police Department
59. Oradell Police Department
60. Palisades Park Police Department
61. Paramus Police Department
62. Park Ridge Police Department
63. River Edge Police Department
64. Rochelle Park Police Department
65. Saddle Brook Police Department
66. Tenafly Police Department
67. Washington Township Police Department
68. Wood-Ridge Police Department
69. Bergen County Police Department

EMERGENCY MEDICAL SERVICE SQUADS

70. Paramus Rescue Squad
71. Hackensack Medical Center
72. Multi-Care Ambulance Service, Inc.
73. M.I.C.C.O.M.
74. Little Ferry First Aid Squad
75. Wayne Township Memorial First Aid Squad
76. Moonachie First Aid
77. Garfield Volunteer Ambulance Corps
78. South Hackensack Volunteer Ambulance
79. Rutherford First Aid Squad
80. City of Passaic First Aid

81. University of Medicine & Dentistry of New Jersey - University Hospital Emergency Medical Services
82. Passaic County Sheriff
83. Hawthorne Ambulance
84. Maywood First Aid & Emergency Squad
85. Lodi Volunteer Ambulance
86. Carlstadt Volunteer Ambulance Corps
87. Saddle Brook Volunteer
88. Rochelle Park Volunteer
89. Wallington Volunteer
90. Wood-Ridge Fire Department
91. Hasbrouck Heights Fire Department
92. Paramus Volunteer Ambulance
93. Teaneck Volunteer Ambulance Corps
94. Haledon Emergency
95. Lyndhurst Police Emergency Squad
96. Bogota First Aid
97. Clifton Fire Department Rescue Ambulance 8-9
98. Fair Lawn Volunteer Ambulance Corps, Inc.
99. Wyckoff Volunteer
100. Glen Rock Volunteer
101. Leonia Volunteer
102. Elmwood Park Volunteer Ambulance Corps
103. Bergenfield Volunteer Ambulance

OTHER AGENCIES

104. Bergen County Department of Health Services
105. Bergen County Prosecutors' Office
106. Bergen County Office of the Sheriff
107. Passaic Valley Sewerage Commissioners
108. American Red Cross
109. New Jersey Department of Environmental Protection
110. New Jersey Department of Transportation
111. Occupational Safety and Health Administration (OSHA)
112. United States Environmental Protection Agency (USEPA) - Office of Removal & Emergency Preparedness Program
113. New Jersey State Police

Appendix B: Medical Records Abstraction Form

Study Number _____ _____ _____

EMERGENCY EVENT MEDICAL RECORD ABSTRACTION FORM A
NAPP Technologies Fire, Lodi

INSTRUCTIONS: Review records for the period April 21 - May 9, 1995. Complete this form ONLY if one of the following is true:

a) Patient presented with any of these symptoms: eye or upper respiratory irritation, sore throat, cough, shortness of breath, wheezing, or chest tightness

AND

b) Patient reported possible exposure to smoke from the NAPP explosion or fire on April 21 or 22, 1995, with or without symptoms

OR

c) Patient employed at NAPP Technologies, Lodi

I. Medical Record Information

Medical Facility Name _____ Record Identifier _____

Date Patient was seen (month/day/year) _____

Physician Name _____

II. Patient Information

Age (years) _____ or Date of Birth ___ /___ /___

Sex ____ Male ____ Female

Race ____ White ____ Black ____ Hispanic ____ Other ____ Unknown

Patient At-risk Group (check one only):

_____ Employee of NAPP

_____ Employee of other business on Main St., Lodi

_____ Emergency responder

_____ Resident of Lodi, Garfield, Elmwood Park, Saddle Brook, FairLawn, Hawthorne (circle)

_____ Other at risk (specify, e.g. driving through area) _____

_____ Not known

Study Number _____ _____ _____

III. Exposure Information

Did patient report exposure to smoke from Lodi fire? YES_____ NO_____

If NO, go to section IV.
If YES, time and date reported exposure began, and length of time exposure lasted

Time Began _____

Date ____/____/____

Duration (hours)_____

Where was patient at time of exposure? _____

IV. Symptoms, Physical Findings, Treatment, Diagnosis

a. Symptoms Reported (Check all that apply)

	Irritated/burning eyes		Nasal congestion		Cough
	Tearing eyes		Runny nose		Chest tightness
	Blurred vision		Shortness of breath		Other (specify)
	Skin rash		Sore or dry throat		
	Headache		Wheezing		None Reported

b. Physical Findings

Physical Finding	Yes, No, or Unknown	Comments
Upper Respiratory Tract Irritation		
Tachycardia		
Lungs: Wheeze, Rales or Rhonchi		
Respiratory Rate > 16/min.		
Cyanosis		
Fatigue, Distress, Confusion		
Other (specify under Comments)		

c. Treatments (Check all that apply)

	Eye drops		IV Fluids		Other (specify)
	Oxygen		Corticosteroids		
	Antibiotics		Sedative agents		
	Bronchodilators		No treatment given		

d. Diagnostic Tests Conducted

Diagnostic Test	Abnormal? Yes, No or Unknown	Comments
CBC with differential		
Arterial blood gas/pH		
Carboxyhemoglobin		
Peak flow test		
Pulmonary function tests		
Chest X-ray		
Other (specify)		

e. Pre-existing Conditions

Condition	Yes, No or Unknown	Comments
Allergies		
Asthma		
Emphysema		
Other lung disease		
Other medical conditions (specify)		
Smoking history		If YES, How many cigarettes/day? _____ How many years? _____ If quit, how long ago? _____

f. Discharge Diagnoses

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

Appendix C: Emergency Event Responder Questionnaire

EMERGENCY EVENT RESPONDER QUESTIONNAIRE
Napp Technologies Fire, Lodi

(Firefighter Variant)

INSTRUCTIONS: Please fill out this form if you were on duty at the time of the Napp Technologies Fire in Lodi during April 21 and April 22, 1995, and participated at the scene in any way.

I. Emergency Responder Information Please check that your name and address are correct. Note any changes to the right of the label. Then please answer the following questions.

What is your home telephone number? ( ) _____ - _____

What is your age? _____ years

Are you ____ male or ____ female?

Are you a ____ volunteer or ____ career firefighter?

II. Symptoms and Medical Attention

a. Please check all symptoms that you experienced within 48 hours after being on duty at the Napp fire:

	Irritated/burning eyes		Nasal congestion		Chest tightness
	Tearing eyes		Runny nose		Nausea or upset stomach
	Blurred vision		Sore or dry throat		Cuts, scrapes, or bruises
	Skin rash		Shortness of breath		Other (please specify)
	Headache		Wheezing		
	Dizziness		Cough		No symptoms

b. Please check whether you sought medical evaluation or treatment after being at the Napp fire:

	Hospital emergency room	Date/Time	Name of Hospital
	Personal physician	Date/Time	Name, Address and Telephone of Physician
	Other	Date/Time	Specify
	I did not seek medical treatment		

III. Schedule of Activities

For each time period listed in the table below:

1. Make an "X" in the 'On Scene' column if you were at the Napp fire scene during the time period.

2. In the 'Jobs/Duties' column, indicate up to three main job duties you had during each time, such as:

Incident Commander	Support (diking, sanding)	Entry Team
Safety Officer	Ventilation	Decontamination
Operations Officer	Primary Search	Air Monitoring
Pump Operator	Rehabilitation	Overhaul
Hose Line Operator	Emergency Medical Services	Police/Public Safety

3. In the 'Protective Equipment' column, please list what personal protective equipment you were wearing for each job duty, such as:

Turn-out gear	Level C	Level A
Turn-out gear with air pack	Level B	

Time Period	On Scene?	Job/Duty	Protective Equipment
April 21, 1995			
8:00 am to noon			
Noon to 6:00 pm			
6:00 pm to midnight			
April 22, 1995			
Midnight to 8:00 am			
8:00 am to 6:00 pm			

Please return form to:

Occupational Health Services
New Jersey Department of Health
CN 360
Trenton, N.J. 08625

EMERGENCY EVENT RESPONDER QUESTIONNAIRE
Napp Technologies Fire, Lodi

(Police and EMT Variants)

INSTRUCTIONS: Please fill out this form if you were on duty at the time of the Napp Technologies Fire in Lodi during April 21 and April 22, 1995, and participated at the scene in any way.

I. Emergency Responder Information Please check that your name and address are correct. Note any changes to the right of the label. Then please answer the following questions.

What is your home telephone number? ( ) _____ - _____

What is your age? _____ years

Are you ____ male or ____ female?

II. Symptoms and Medical Attention

a. Please check all symptoms that you experienced within 48 hours after being on duty at the Napp fire:

	Irritated/burning eyes		Nasal congestion		Chest tightness
	Tearing eyes		Runny nose		Nausea or upset stomach
	Blurred vision		Sore or dry throat		Cuts, scrapes, or bruises
	Skin rash		Shortness of breath		Other (please specify)
	Headache		Wheezing		
	Dizziness		Cough		No symptoms

b. Please check whether you sought medical evaluation or treatment after being at the Napp fire:

	Hospital emergency room	Date/Time	Name of Hospital
	Personal physician	Date/Time	Name, Address and Telephone of Physician
	Other	Date/Time	Specify
	I did not seek medical treatment		

III. Schedule of Activities (Police Variant)

For each time period listed in the table below:

1. Make an "X" in the 'On Scene' column if you were at the Napp fire scene during the time period.

2. In the 'Jobs/Duties' column, indicate up to three main job duties you had during each time, such as:

Incident Command
Traffic Control
Site Security
Investigation
Crowd Control

3. In the 'Protective Equipment' column, please list what personal protective equipment you were wearing for each job duty, such as a respirator, gloves, or coveralls.

Time Period	On Scene?	Job/Duty	Protective Equipment
April 21, 1995			
8:00 am to noon			
Noon to 6:00 pm			
6:00 pm to midnight			
April 22, 1995			
Midnight to 8:00 am			
8:00 am to 6:00 pm			

Please return form to:

Occupational Health Services
New Jersey Department of Health
CN 360
Trenton, N.J. 08625

III. Schedule of Activities (EMT Variant)

For each time period listed in the table below:

1. Make an "X" in the 'On Scene' column if you were at the Napp fire scene during the time period.

2. In the 'Jobs/Duties' column, indicate up to three main job duties you had during each time, such as:

Patient Transport	Staging
Triage	Decontamination

3. In the 'Protective Equipment' column, please list what personal protective equipment you were wearing for each job duty, such as a respirator, gloves, or coveralls.

Time Period	On Scene?	Job/Duty	Protective Equipment
April 21, 1995			
8:00 am to noon			
Noon to 6:00 pm			
6:00 pm to midnight			
April 22, 1995			
Midnight to 8:00 am			
8:00 am to 6:00 pm			

Please return form to:

Occupational Health Services
New Jersey Department of Health
CN 360
Trenton, N.J. 08625

EMERGENCY EVENT RESPONDER QUESTIONNAIRE
Napp Technologies Fire, Lodi

(Variant for Other Responders)

INSTRUCTIONS: Please fill out this form if you were on duty at the time of the Napp Technologies Fire in Lodi during April 21 and April 22, 1995, and participated at the scene in any way.

I. Emergency Responder Information Please check that your name and address are correct. Note any changes to the right of the label. Then please answer the following questions.

Name _____
First Last

Job Title _____

Address _____
Street

_____
City State Zip Code

What is your home telephone number? ( ) _____ - _____

What is your age? _____ years

Are you ____ male or ____ female?

II. Symptoms and Medical Attention

a. Please check all symptoms that you experienced within 48 hours after being on duty at the Napp fire:

	Irritated/burning eyes		Nasal congestion		Chest tightness
	Tearing eyes		Runny nose		Nausea or upset stomach
	Blurred vision		Sore or dry throat		Cuts, scrapes, or bruises
	Skin rash		Shortness of breath		Other (please specify)
	Headache		Wheezing		
	Dizziness		Cough		No symptoms

b. Please check whether you sought medical evaluation or treatment after being at the Napp fire:

	Hospital emergency room	Date/Time	Name of Hospital
	Personal physician	Date/Time	Name, Address and Telephone of Physician
	Other	Date/Time	Specify
	I did not seek medical treatment		

III. Schedule of Activities

For each time period listed in the table below:

1. Make an "X" in the 'On Scene' column if you were at the Napp fire scene during the time period.

2. In the 'Jobs/Duties' column, indicate up to three main job duties you had during each time. Please be as specific as possible.

3. In the 'Protective Equipment' column, please list what personal protective equipment you were wearing for each job duty, such as a respirator, gloves, or coveralls.

Time Period	On Scene?	Job/Duty	Protective Equipment
April 21, 1995			
8:00 am to noon			
Noon to 6:00 pm			
6:00 pm to midnight			
April 22, 1995			
Midnight to 8:00 am			
8:00 am to 6:00 pm			

Please return form to:

Occupational Health Services
New Jersey Department of Health
CN 360
Trenton, N.J. 08625