1991

Loma Prieta's Call to Action

Seismic Safety Commission

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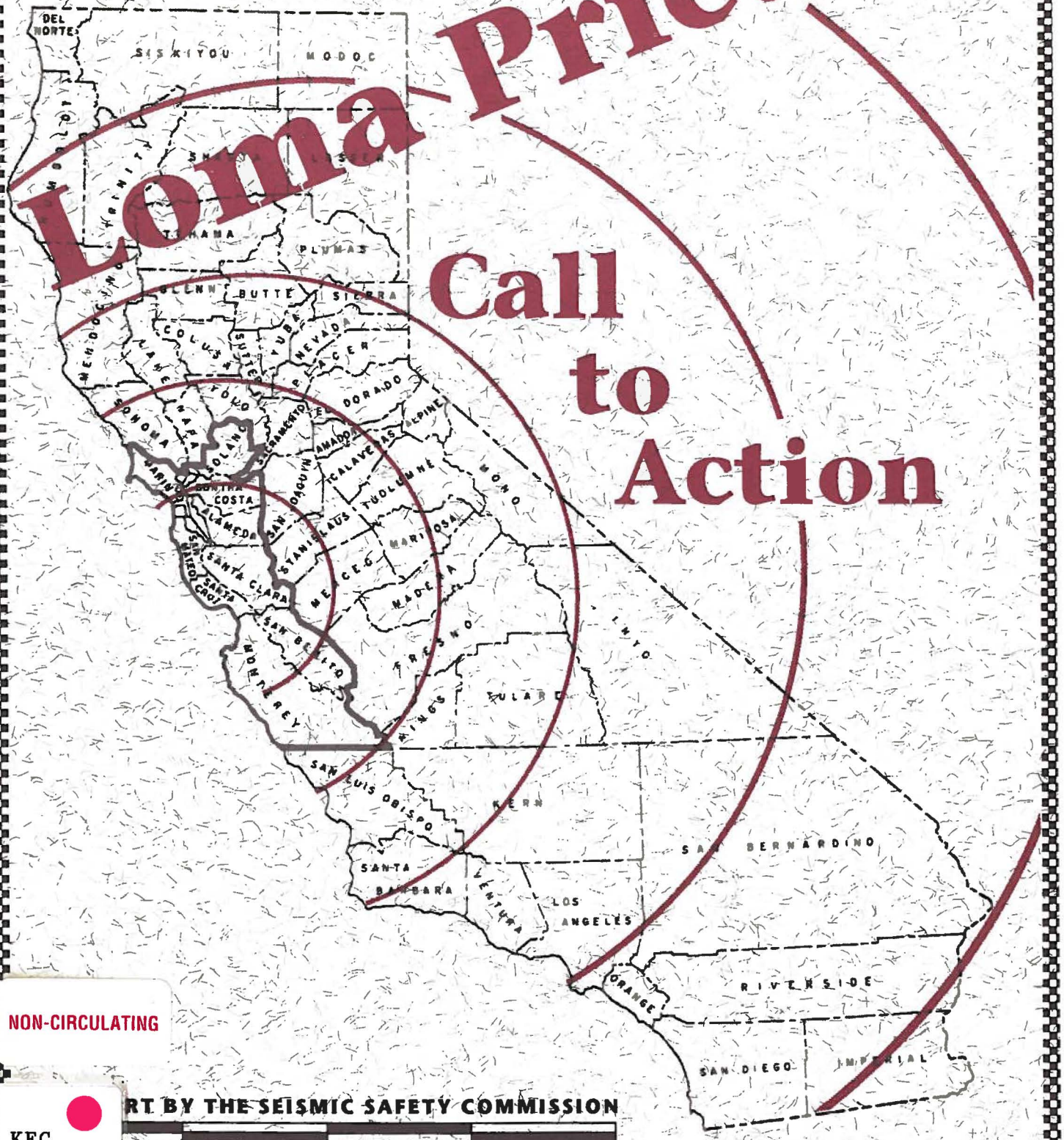

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LOMA PRIETA'S CALL TO ACTION
SEISMIC SAFETY COMMISSION 1991

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Loma Prieta's Call to Action

Report on the Loma Prieta Earthquake of 1989

California Seismic Safety Commission
Sacramento, California
1991

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Summary and Conclusions

Earthquake Effects

Despite its sparsely populated epicentral location, the October 17, 1989, Loma Prieta earthquake resulted in approximately $10 billion in direct damage and indirect losses. There were 63 deaths and 350 hospitalized injuries. Many of these resulted from damage to state highway structures; the collapsed I-880 Cypress Street viaduct took 43 lives. Publicly funded disaster relief and recovery program expenditures will ultimately total $3 to $4 billion. Individuals and public and private organizations will absorb approximately $6 to $7 billion. In short, the costs of this earthquake are equivalent to an expenditure of $1700 each for the six million people residing in the ten-county, Presidentially declared disaster area.

The Loma Prieta earthquake did not really test most of the building stock in the Bay Area and nearby affected counties. Thus few modern buildings were subjected to high levels of ground motion, although some that were shaken experienced major structural failures. Also many older buildings of types known to be vulnerable experienced severe damage, especially in the hardest-hit areas. In all, over 24,000 residential structures, 3,500 commercial businesses, and 140 public buildings in the ten-county area sustained earthquake damage. Nevertheless, as noted, the region's building stock was not tested the way it would have been by stronger ground motion, longer duration, or both. Such effects must be anticipated in future Bay Area earthquakes that are certain to test our building stock much more severely and that undoubtedly will cause much greater damage.

The earthquake's most spectacular building damage affected unreinforced masonry structures, many of which were located in older downtown commercial areas. There was widespread commercial core area damage in Hollister, Los Gatos, Santa Cruz, and Watsonville. A quarter to a third of the buildings in each of these business districts were severely damaged, and in Santa Cruz and Watsonville, most were razed. Of approximately 900 unreinforced masonry (URM) buildings damaged in the earthquake, at least 50 were irreparable, and another 350 were severely damaged. Eight deaths resulted from damage to these URM buildings.

In Santa Cruz County where the epicenter was located approximately 14,100 housing units were damaged, of which about 900 were destroyed. In short, 16 percent of the County's housing stock of 90,000 units was directly affected. In Watsonville, eight percent of the residential units were destroyed. Approximately 1000 units were destroyed in Oakland, and in San Francisco about 500 units were permanently lost and another 500-600 units were severely damaged and have not yet been restored.

Policy Framework

In formulating its recommendations, the Commission fully recognized the current fiscal distress of state and local governments. Consequently a key objective is maintaining the current programs and staffing built up over the past two decades. Without this, progress toward earthquake safety will be set back severely and crucial momentum lost. The Commission also understands that to be realistic, hazard reduction and remedial programs must be scheduled over a considerable time. Meanwhile,

however, other methodical and persistent efforts can also pursue less costly approaches. The state and local governments, the private sector, and citizens can take many prudent and economical measures to reduce future losses and facilitate recovery.

In addition, the Commission suggests that the state spend or authorize money for building rehabilitation only if assured that the resulting projects will identify earthquake hazards and mitigate them to the extent practicable.

Another consideration behind the primary recommendations is recent estimates of the likelihood of a major earthquake. The Commission accepts the validity of scientific forecasts showing a 90 percent chance of a large earthquake striking a major California urban center at some time in the next 30 years. Such an event in either southern or northern California would cause 10 to 20 times as much damage, loss, and social disruption as that resulting from the Loma Prieta earthquake. Consequently, the Commission recommends State and local decisions take this likelihood into account when setting program priorities and allocating resources. Public information and response capacity building efforts should be stepped up. Local and regional emergency planning should be expanded and exercises should be held more frequently. Resources allocated for hazard reduction should be redirected to regions known to have high near-term risks of experiencing major earthquakes.

Finally, a third factor underlying the Commission's recommendations is awareness that future earthquake damage will not be distributed randomly. Damage patterns are generally predictable and are closely correlated with structures' age, the quality of construction, and site geologic conditions. Combinations of these predisposing conditions can be found almost anywhere in the State, but unfortunately are most commonly concentrated in the densely populated older downtown areas of both small towns and major cities. While much of California's growing population lives in relatively new housing that is generally resistant to earthquake damage, many others are more densely housed and employed in older buildings and neighborhoods that are quite vulnerable to failures and falling hazards. Many commuting urban workers are also exposed to such life-threatening hazards on a daily basis. This indicates that the catastrophic potential that already threatens Californians most at risk to earthquake damage is increasing.

The three factors noted—tight fiscal constraints, expected near-term large earthquakes in urban areas, and the growing numbers of people in particularly vulnerable buildings and locales—prompted the Commission to highlight cost-effective recommendations emphasizing the areas known to be most vulnerable to earthquakes.

Summary of Major Recommendations

NEW CONSTRUCTION

The most cost-effective long-term protection from the impacts of earthquakes is to ensure that new construction is designed and built to withstand seismic forces consistent with the performance goals of the Commission's Risk Policy (SSC 91-01). Current seismic codes and design practices emphasize life safety. Owners should be made aware that these minimum standards are not intended to assure a building's survival in a functional or even a repairable condition after an earthquake. Some owners already recognize this and make prudent business decisions to assure higher level of seismic performance by insisting on higher-than-code minimum design and a thorough awareness of the construction process. Other owners should be encouraged to adapt this kind of sensible and fiscally sound policy for their new construction.

Architects and engineers should emphasize to their clients that design techniques and construction practices can provide differing levels of earthquake performance, and should require owners to make definite decisions in

consciously choosing levels of seismic performance that are appropriate to the intended long-term use of their structures. The Commission's 1991 report *Policy on Acceptable Levels of Earthquake Risk in State Buildings* develops this policy in more detail. Furthermore codes and performance standards are effective only if the designs are properly executed and are enforced through quality assurance programs. To be effective, the program should include independent peer review of plans for all important structures; checking of design drawings, calculations, and specifications; adequate construction inspection; and observation of key construction details by responsible design professionals. The Commission is committed to continuing its effort to secure wider acceptance of this approach to decisions on new construction.

STATE SPENDING LIMITATIONS

The State should no longer aid in extending the economic life of older and potentially dangerous facilities unless the hazards are mitigated in an appropriate, cost effective manner. The Seismic Safety Commission recommends that the State of California adopt a policy discouraging use of state money or state-administered funds to rehabilitate existing structures unless proponents of the projects can demonstrate that seismic hazard mitigation is given appropriate priority. The policy should apply to all state-owned, state-leased, state-assisted or state-regulated facilities, including buildings, utilities, and other infrastructure.

The Seismic Safety Commission is committed to working with the legislature and departmental legislative staff to identify existing law and proposed legislation pertaining to state authorization or expenditures for rehabilitating older structures. Where possible, state involvement should include a requirement for appropriate seismic retrofit of such older structures when they are rehabilitated. Consistent guidelines or standards (when available) should be applied when older structures are being seismicly retrofitted with state approval or money.

EMERGENCY RESPONSE

The Loma Prieta earthquake's epicenter was distant from the Bay Area's major population centers, and governmental response to the emergencies caused by the earthquake was generally adequate. In several cases, however, available resources were stretched to capacity, and a more destructive earthquake with an urban epicenter on the Hayward fault or the Peninsula segment of the San Andreas fault would overwhelm the Bay Area's existing emergency response capabilities. Improvements are needed in personnel training and equipment, particularly communications. The adequacy of older underground water systems should also be systematically evaluated. In several locations, the earthquake destroyed water systems, dramatically limiting firefighting capabilities. The value of pre-earthquake experience in the regular routine practice of emergency response was often rated as the most important contributor to good performance in responding to the Loma Prieta earthquake. Several more specific recommendations are noted below.

Emergency Management. There is an urgent need to enhance, expand, and improve California's current Emergency Management System. The system should be standardized, integrated, understood, and accepted. It should be organized from cities to counties to State regions, and finally to the State Operations Center and other state agencies support operations. It should be integrated into existing, functioning day-to-day organizations instead of paper organizations that are expected to somehow become operational when an emergency occurs.

Communications. The Coalinga, Whittier Narrows, and Loma Prieta earthquakes once again demonstrated the potential for

interruption of radio and telephone communication systems. A full and comprehensive review of those capabilities should be made. That review should incorporate knowledge about the role satellite communications can play in a major emergency. This review should also evaluate the potential for diminished effectiveness of cellular phone systems when they are used simultaneously by many who converge at the same general location. The impact of piecemeal implementation of the 800 Megahertz (800 MHz) communication systems on mutual aid response capabilities should also be included.

Mass Care And Shelter. Even a moderate earthquake can rapidly overwhelm the ability of local governmental and volunteer organizations to provide immediate and long-term care and shelter. Additional local organizations need to be brought into the process of planning for and providing emergency care and shelter. These capacity building efforts should include organizations representing the diversity of citizens most at risk in each locale.

HAZARD REDUCTION IN EXISTING STRUCTURES

Building damage by the Loma Prieta earthquake confirmed the value of ongoing efforts to improve the seismic resistance of existing buildings and other structures. The Commission should therefore continue to seek a high priority for such efforts in California's seismic safety program. As expected, building damage was notably high in older unbraced homes, mobile homes without earthquake-resistant underpinnings, and unreinforced masonry (URM) buildings. Although important progress is being made in confronting the URM building danger, California has not yet mustered the political resolve to require seismic bracing or anchoring of older homes or of mobile homes. Nor has California begun to deal with some other significant hazardous building types (e.g., nonductile concrete). The state's next major damaging earthquake could tip the balance from inaction to action, particularly if the groundwork for further progress has been well laid. Consequently the Commission and others are obligated to continue informing owners about the value of prompt action in taking adequate precautions to reduce their future earthquake losses.

A related concern is the absence of consensus standards for nonductile concrete structures, to guide hazard evaluation, cost estimation, and retrofit practice. Lack of such standards is a significant impediment to either encouraging or requiring retrofit of such nonductile structures, as well as other potentially hazardous types of buildings. Accordingly development of guidelines for nonductile concrete structures and other potentially unsafe buildings is another high-priority Commission recommendation.

State Facilities. Governor Deukmejian's Board of Inquiry on the collapse of the Cypress Overpass recommended in its report, *Competing Against Time,* that seismic safety be a priority consideration for all state government facilities. It urged the state to take the following steps to achieve the goals of seismic safety and maintenance of critical functions after earthquakes:

- Complete programs of seismic retrofitting of existing hazardous facilities
- Review and revise seismic safety standards to meet these goals
- Require independent review of major designs of facilities
- Conduct vigorous programs to enhance professional expertise in earthquake engineering and earthquake research

Although considerable progress and funding have been realized in the State's Department of Transportation, similar efforts have either not been started or have lagged in nearly all other state agencies (see the Commission's report on Executive Order D-86-90, report number SSC 90-06). These shortcomings have not been addressed. The Commission and others must work harder to enhance hazard reduction efforts

or otherwise we face the same lessons and consequences after future earthquakes. The Commission must also continue to review and assess the adequacy of seismic hazard reduction programs of all state agencies.

The State of California should review the geological siting and structural design of seismicly suspect State-owned buildings and privately owned buildings occupied by State agencies. Where warranted, facilities should be retrofitted or abandoned if necessary to protect the public, state employees, and university students, as well as the continuity of emergency response and other essential services functions. Priorities for these efforts should be based on the likelihood of future major earthquakes striking as well as the quality of design and construction.

RECOVERY AND RECONSTRUCTION

Standards For Repair Of Damaged Buildings. Damage assessment and repair cost estimating after the Loma Prieta earthquake were time-consuming and confusing. There was too much duplication of effort in deciding on methods and estimating costs of repairing damaged structures. Consequently loans and grants were delayed, and restoration of community vitality retarded. Accordingly, the State should formulate guidelines and minimum standards for damaged building repair and seismic upgrading. The standards should apply unless individual local governments adopt higher standards.

Damaged historical buildings can also pose difficult decisions. The owner may find repair financially infeasible whereas demolition will remove a valuable community asset. Repair decisions are hindered by lack of repair codes, financial aid, and methods of determining in advance which are the critically important buildings that should be saved. The Commission should help enlist appropriate agencies and organizations in identifying and retrofitting California's historic buildings, and establishing a practical strategy to deal with structures damaged in future earthquakes.

Model And Requirements For Community Recovery Planning. Recently the Governor's Office of Emergency Services' Southern California Earthquake Preparedness Project (SCEPP), released an important publication, *Recovery and Reconstruction Planning Guidelines for Local Governments*. This publication represents several years of work that brought together a wide variety of knowledgeable people, including community officials from Whittier and Santa Cruz. The State OES (including SCEPP, BAREPP and the Disaster Assistance Division) should be funded to undertake, along with selected local governments, an experiment in implementing the new guidelines. This would provide viable planning models to guide other jurisdictions. The Commission is committed to help OES organize and obtain resources for such an action-oriented demonstration effort.

State Recovery Planning. Although recovery from the Loma Prieta earthquake is still in progress and many reconstruction projects have barely begun, several major impediments to timely, effective community recovery have emerged as issues of statewide interest. The State must work in cooperation with the appropriate federal agencies and the private-sector to resolve these issues and facilitate expeditious recovery from future urban earthquakes. Planning efforts should address at least the following issues: (1) an overly complicated procedure for processing disaster assistance applications; (2) effective methods of replacing affordable and low-cost housing in conjunction with local governments and the private-sector; (3) the development of minimum standards for repairing damaged buildings; and (4) formulating a practical approach to decisions on repairing or replacing historical buildings damaged by earthquakes.

In addition, Loma Prieta damage of public buildings and other facilities highlighted the disruption caused by temporary or long-term closure. In order to minimize social and

economic disruption after future earthquakes, state agencies and institutions need to begin planning for their own recovery.

Legal Issues

Tort liability concerns have inhibited innovation in the seismic retrofitting of potentially hazardous buildings as well as the development of seismicly resistant new buildings. Local governments and design professionals need a legal benchmark [standard] that is clearly defined and easy to articulate for use when their professional judgement suggests that it is appropriate to depart from existing building codes in mitigating seismic hazards in buildings and structures. The Commission should enlist representatives of local governments, design professionals, and the legal community in developing a framework that encourages local governments and design professionals to exercise creativity and apply their best judgment without unwarranted apprehension of tort liability consequences.

Chapter 1

Introduction

Purpose of This Report

This report's primary purpose is to summarize the results of the Seismic Safety Commission's investigation of the 1989 Loma Prieta earthquake. The investigation had two primary objectives: 1) to look for unique insights and new information; and 2) to assess the effectiveness of current policies, programs and plans for reducing casualties and damage, and meeting recovery system demands, during and after large earthquakes. Based on the findings, the Commission is making recommendations to improve seismic safety and postearthquake response and recovery in California. Some of these require Commission response and some call for actions by others.

Post-Loma Prieta earthquake recommendations and actions by the Commission and others have already influenced Commission programs and priorities, including its legislative agenda, its research plan, and the *California Earthquake Hazard Reduction* program. The findings will also be reflected in Commission activities undertaken to improve the earthquake performance of existing and new buildings and other structures.

Some extremely important legislative and executive policy initiatives have already been put into effect. One of the most striking is Governor's Executive Order D-86-90 directing the several state agencies having responsibility for many of the state-owned buildings and structures to make seismic safety a priority consideration in the allocation of resources. Governor Deukmejian's action resulted in part from the findings of his appointed Board of Inquiry on the 1989 Loma Prieta earthquake. The Board's Report to the Governor, *Competing Against Time* (May 1990), identified three essential challenges that must be addressed by the citizens of California, if they expect a future reasonably safe from earthquakes:

- Ensure that earthquake risks posed by new construction are acceptable.
- Identify and correct unacceptable seismic safety conditions in existing structures.
- Develop and implement actions that foster the rapid, effective, and economic response to and recovery from damaging earthquakes.

These recommendations also reaffirm old lessons from earlier earthquakes. They apply not only to the design and construction of highway structures and bridges (the failure of which prompted the Board's formation) but also to all other major structures and facilities in the state.

During its investigation, the Commission took testimony and consulted a wide variety of sources, both published and unpublished. As soon as possible after the earthquake, the Commission conducted eight public hearings at locations throughout the affected area and in Sacramento in order to receive fresh information from 120 persons representing government, citizens and business[1] . The testimony concentrated on personal descriptions of the earthquake and its damage, and related experiences and observations immediately after the earthquake as well as in the weeks that followed. The eight hearings were held at these locations:

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1 This testimony has been transcribed and reproduced. It is available for review at the Seismic Safety Commission (Sacramento), Bay Area Regional Earthquake Preparedness Project (Oakland), the Earthquake Engineering Research Center (Richmond), and the Southern California Earthquake Preparedness Project (Pasadena).

LOCATION	DATE
San Francisco	October 31, 1989
Oakland	November 8, 1989
San Francisco	November 9, 1989
Santa Cruz	November 14, 1989
Watsonville	November 14, 1989
San Jose	November 15, 1989
Sacramento	December 14, 1989
Sacramento	January 11, 1990

In addition, the Commission and its Earthquake and Emergency Preparedness and Response Committee held several hearings after both the Whittier Narrows and the Loma Prieta earthquakes, focusing on issues related to improving to earthquake emergency response.

One year after the Loma Prieta earthquake and partially in commemoration of that event, the Commission held its October 11, 1990, meeting in Santa Cruz. It heard from 15 people—mostly local public officials who had testified previously—on the issues and status of community recovery. This testimony transcript is also available for review at the Seismic Safety Commission's office in Sacramento.

Upon considering the body of testimony by the local public officials, Commission staff had subsequent discussions with selected communities among those most affected by the Loma Prieta earthquake. Six local governments were invited to prepare individual reports for inclusion in the Commission's own report of its investigation. The invited jurisdictions were asked to: 1) highlight postearthquake problem areas and other issues; and 2) to offer suggestions for changes in policies and programs that might assist local jurisdictions in future earthquakes. These local reports are published as Section Six.

Characteristics of the Loma Prieta Earthquake

On October 17, 1989, the Loma Prieta earthquake and its effects took less than 10 seconds of strong shaking to cause at least eight billion dollars in direct damage, 63 deaths and 350 serious injuries. Almost one-third of this damage was to older, elevated highway structures and bridges. These failures also caused two thirds (42) of the total deaths. Other damage was concentrated in the older downtown core areas and older housing in the communities nearest the epicenter: Hollister, Los Gatos, Santa Cruz, and Watsonville. Many homes, scattered throughout the epicentral region of the Santa Cruz Mountains, were severely damaged, both directly by earthquake shaking and indirectly by secondary effects of landsliding and other ground deformations. Pockets of severe damage occurred at soft soils locations in Oakland and San Francisco, 50-60 miles from the epicentral region. Isolated but severe damage occurred in modern structures; several newer San Francisco Airport hotels were closed for repair and one of these has not yet reopened.

The main shock of the earthquake occurred at 5:04 PM on October 17, 1989, and measured Magnitude 7.1. It is believed to have reruptured the southernmost 25-mile segment of the 1906 San Andreas fault break. The hypocenter was approximately 11.5 miles deep on the San Andreas fault. The rupture spread about 25 miles northwest and southeast and upward about 8 miles, stopping about 3 to 4 miles from the surface. Although fissures and slips in soil were widespread along the Santa Cruz mountain segment of the San Andreas fault zone, no evidence of surface fault offset was found. Another unique aspect of this fault rupture is that it extended simultaneously in two directions from the focal point rather than the expected single predominant direction. This bilateral energy release accounted for the shorter duration of shaking (only ten seconds of strong shaking) than would normally be expected from a Magnitude 7.1 earthquake (20 to 30 seconds).

The earthquake was felt over an area of approximately 400,000 square miles, from Los Angeles to the Oregon border. The energy released as seismic waves was approximately equal to the total energy yield from one thermonuclear bomb (500,000 tons of TNT) (Plafker and Galloway 1989).

The earthquake triggered numerous landslides, leading to lateral spreading and fissures that were often reported as fault offsets. A series of surface fractures occurred in the Summit Road area of the Santa Cruz mountains. The largest of these fractures, near the intersection of Summit Road and Highway 17, was 650 feet long, 2.5 feet wide with a 2.5-foot offset at one location. There continues to be concern that the earthquake may have reactivated some large, long-dormant landslides through the mountainous area, and detailed study of this potential is continuing.

Despite its brevity, the Loma Prieta earthquake did in fact cause very significant liquefaction-related damage in many areas from the Salinas Valley to the edges of San Francisco Bay. Notable examples of liquefaction damage occurred at Oakland Port Authority facilities, at the marine research facilities at Moss Landing and at the Oakland airport, which closed the north section of a runway. If the earthquake had lasted appreciably longer, liquefaction damage would undoubtedly have been much more severe in many susceptible parts of the region. Extensive liquefaction damage should be anticipated in future Bay Area earthquakes of longer duration and stronger shaking.

In areas of San Francisco, man-made lands were developed by pumping hydraulic fills (loose bay bottom materials) into confined areas. These areas include, among others, the Marina, the foot Market Street area, several south of Market Street areas and the Mission Creek district. In areas such as these, even moderate ground shaking caused settlement, ground displacement and lateral movement.

TABLE 1-1

History of San Francisco Bay Area
Earthquakes Magnitude 6.5 or greater

Year	Location	Fault	Estimated Magnitude
1836	Hayward	Hayward (Northern segment)	7+
1838	San Francisco Peninsula	San Andreas	7+
1852	San Francisco Peninsula	San Andreas	~6.5
1858	San Jose	Hayward (Southern segment)	~6.5
1861	Livermore	Calaveras	7+
1865	Santa Cruz Mountains	San Andreas	7+
1868	Hayward	Hayward (Southern Segment)	6.7
1906	San Francisco	San Andreas	8.3
1911	San Jose	Calaveras	6.6
1989	Loma Prieta	San Andreas	7.1

The newer, engineered artificial fills that were created for residential development south of San Francisco performed well, although this short duration earthquake did not provide a good test of these filled areas.

RELATIONSHIP TO FUTURE EARTHQUAKES

Studies of seismicity in California and other areas where major tectonic plates meet indicate

that great earthquakes tend to be preceded by periods of increased seismic activity, which then diminishes afterward. That is, there is an historic pattern of large and major earthquakes clustering before a great earthquake. As indicated on Table 1-1, after the 1906 earthquake (and a sizable Magnitude 6.5 in 1911), there was a long period of low seismic activity until the mid 1950s, but since that time there has been increasing seismic activity in northern California. During the ten years since 1979, there have been four Magnitude (M) 6.0 or greater Bay Area earthquakes whereas in the previous 68 years there had been none. This knowledge and other scientific information have led a working group of experts for the National Earthquake Prediction Council to estimate that the probability of a major earthquake (M 7.0 or larger) affecting the San Francisco Bay area sometime during the next 30 years is 67 percent, or 2:1. In addition, an apparent historical relation between the Hayward and the San Andreas faults suggests that a significant earthquake on one fault is followed within a few years by a similar event on the other.

The Earthquake in Perspective

The Loma Prieta earthquake affected many more buildings, people and jurisdictions than any California earthquake since the Los Angeles region was hit by the 1933 Long Beach earthquake. Thus the 1989 event is the first occasion in nearly sixty years to assess the effects of a large multijurisdictional earthquake. By simultaneously affecting widespread populations, businesses and governmental agencies, Loma Prieta highlighted a range of troubling problems. These will recur with even greater severity in future big urban earthquakes that are certain to strike, perhaps at any time.

With its estimated magnitude of 7.1, the Loma Prieta earthquake was the largest in California since the 7.7 Kern County (Bakersfield) earthquake of 1952, 37 years earlier. As was true in Kern County, the Loma Prieta epicenter was located in an area of relatively sparse population. Despite this rural epicentral site, which was fortunate in keeping down the damage and casualty count, the Loma Prieta earthquake nevertheless directly affected the more than 85,000 individuals, families and businesses that registered for some form of disaster assistance. The overall secondary effects were much more widely felt. Almost everyone in the entire region was in some way affected.

Table 1-2 includes 17 damaging earthquakes that struck California in the past 20 years. Loma Prieta accounted for over three-quarters (78%) of the total estimated damage caused by all of these earthquakes.

Major Issues Highlighted in the Earthquake

The Loma Prieta earthquake highlighted several scientific, engineering and policy issues, including some that have not commonly arisen in recent, smaller California earthquakes. Popular images of damage associated with this earthquake are typified by the failure of elevated, double decked highway structures and bridges, including the collapse of the Interstate 880 Cypress Street viaduct and partial collapse of a segment of the Oakland–San Francisco Bay Bridge. Smoke from the large fire in the San Francisco Marina district was witness to severe damage throughout this upper-middle class neighborhood. Soft soils throughout the area accelerated the ground shaking that, in turn, led to locally significant damage to infrastructure and older residential buildings. Dramatic scenes of deformation and facilities damage due to liquefaction in the area controlled by the Port of Oakland account for other memorable images of the Loma Prieta earthquake. Severe and widespread damage to the vulnerable unreinforced masonry buildings was nowhere more dramatized than at the Pacific Garden Mall; the heart of older downtown Santa Cruz.

These images of damage also point to some of the dominant issues immediately raised by this earthquake, especially to the future vulnerability of older elevated highway structures and bridges, the acceleration of ground shaking and associated damage to structures located on unmitigated soft soils conditions and the continuing vulnerability of unreinforced masonry and other older buildings that lack resistance to earthquake forces. While these and related issues will be briefly addressed in this report, they have been, and continue to be specifically addressed by ongoing policies and programs and have already been subject of reports and studies by the Seismic Safety Commission and other groups.

For the reader who seeks detailed discussion of the scientific and technical aspects of these issues, the following published reports offer an excellent beginning. Much of the scientific study of the Loma Prieta earthquake is ongoing, with major conclusions yet to be published.

For a comprehensive summary of effects, see EERI (Earthquake Engineering Research Institute), 1990, *Loma Prieta Earthquake Reconnaissance Report*. Earthquake Spectra, El Cerrito, [now Oakland] California, Report 90-01, 488 pp.

For a detailed study of major highway and bridge damage see Governor's Board of Inquiry on the 1989 Loma Prieta earthquake, 1990, *Competing Against Time: Report to Governor George Deukmejian*. State of California, Office of Planning and Research, 264 pp. Policy and program recommendations are made in that report and in Seismic Safety Commission, 1990, *Report to Governor George Deukmejian on Executive Order D-86-90*, 25 pp., Sacramento.

Descriptions and studies of the earthquake's geological characteristics are provided by Plafker, G., and Galloway, J.P., 1989, *Lessons Learned from the Loma Prieta, California, Earthquake of October 17, 1989*. U.S. Geological Survey Circular 1045, 48 pp. and McNutt, Stephen R. and Robert H. Sydnor (Eds.), *The Loma Prieta (Santa Cruz Mountains), California*

TABLE 1-2

Damaging California Earthquakes
1971-1991

Year	Location	Magnitude	Estimated Direct Damage ($ millions)[2]
1971	San Fernando	6.4	$1,646.0
1975	Oroville	5.7	6.7
1978	Santa Barbara	5.1	24.2
1979	Imperial Valley	6.6	60.6
1980	Livermore Valley	5.5	18.4
1980	Mammoth Lakes	6.2	3.2
1980	Humbolt County (offshore)	6.9	2.8
1983	Coalinga	6.5	41.0
1984	Morgan Hill	6.2	12.7
1986	Palm Springs	5.6	6.4
1986	Oceanside	5.3	
1986	Chalfant Valley	6.4	0.5
1987	Whittier Narrows	5.9	415.3
1987	Superstition Hills	6.6	3.1
1989	Loma Prieta	7.1	7,940.0
1990	Upland	5.5	10.4
1991	Sierra Madre	5.8	32.0

[2]Dollars inflated to 1990 value according to Consumer Price Index. Source: Adapted from McNutt and Sydnor 1990, p. 137.

Earthquake of 17 October 1989. 1990, Division of Mines and Geology, California Department of Conservation Special Publication 104, 142 pp.

The performance of buildings and infrastructure is described in EERI (above); in Lew, H.S. (Ed.), 1989, *Performance of Structures During the Loma Prieta Earthquake of October 17, 1989*; in U.S. Department of Commerce, National Institute of Standards and Technology, Special Publication #778, 175 pp.; and in Structural Engineers Association of California, 1991, *Reflections on the October 17, 1989, Loma Prieta Earthquake*. Ad Hoc Earthquake Reconnaissance Committee, 177 pp., Sacramento.

The balance of this report provides syntheses of the human, organizational, legal, and fiscal aspects of the Loma Prieta earthquake. Where possible, policy implications are identified with emphasis on what the Loma Prieta earthquake experience suggests that California needs to do in advance of the large earthquakes that are forecast to strike major urban areas within the foreseeable future.

Chapter 2

Earthquake Effects and Emergency Response

Earthquake Effects

Society's resources are at risk to earthquake damage through failures of the built environment. The Loma Prieta earthquake was a moderate geophysical event centered in a sparsely populated semi-rural region. Nevertheless many of the most vulnerable structures in the area were affected by the earthquake's forces. Within a few seconds, approximately $7.5 billion in direct damage to structures had been tallied.

BUILDINGS

Pretty much, the type of damage that we saw was great damage to our unreinforced masonry structures. The Town of Los Gatos is a very old and proud historic town, many, many structures built right around the turn of the century, and even before, and unfortunately, those buildings did not perform well.

We also had the other classic example of cripple wall failure in our older districts as well, just a substantial number of homes. Perhaps as many as 10 percent of our homes have suffered some sort of structural damage, and the majority of that is a cripple wall failure.

Scott R. Baker
Building Official
Los Gatos

Few modern buildings were subjected to high levels of ground shaking in the Loma Prieta earthquake, consequently this earthquake should not be considered to have tested codes and construction aimed to reduce life-safety hazards. In a few cases, newer buildings were severely damaged. Several were closed for repair, especially some hotels located on poor soils near the San Francisco Airport. One has not yet reopened.

Certain types of older structures known to be vulnerable were severely damaged. In all, over 24,000 residential structures, 3,500 commercial businesses, and 140 public buildings in the affected ten county area were damaged as a result of the earthquake. The most spectacular failures involved unreinforced masonry buildings. Many of these were located in older downtown commercial areas, including Hollister, Los Gatos, Santa Cruz and Watsonville, where quarter to a third of the buildings were severely damaged. In Santa Cruz and Watsonville most were razed. At least 900 unreinforced masonry (URM) buildings were damaged in the earthquake. Eight deaths resulted from the partial collapse of URM buildings. At least 50 of the 900 were irreparable, and another 350 were severely damaged. The ultimate fate of some of them is still unknown. URM building damage was notably correlated with soft soils locations. In Santa Cruz County many older homes and unbraced mobile homes sustained damage. About 16% of the County's housing stock of 90,000 was affected directly. Table 2-1 shows the type and number of damaged housing by level of damage. Approximately 14,100 living units in the County were damaged, of which about 900 were destroyed. Comparable data are not available for other affected jurisdictions and no agency keeps track of the number of actual dwelling units affected. It is known however, that approximately 1000 units were destroyed in Oakland and about 500 units were permanently

lost in San Francisco. Another 500-600 units in San Francisco have not yet been restored and it is uncertain whether or when they will be. The vast majority of the permanently displaced residents were persons of low-income and very-low-income.

> *I think a lot of communities should survey and require bracing of older homes that have insufficient lateral bracing. It's a very simple cure to strengthen these homes and not lose your housing stock. It wouldn't have a large financial impact to a community.*
>
> *Neil England, Building Official*
> *City of Watsonville*
> *November 14, 1989*

Many older residential wood frame structures failed throughout the impacted area. Earthquake damaged structures typically were either not fastened to their foundations (anchor bolts),

TABLE 2-1

Santa Cruz County: Summary of Damage to Housing

Category	Capitola	Scotts Valley	Santa Cruz	Watsonville	Uninc.	Countywide
Destroyed						
Dwellings	3	4	74	237	356	674
Mobilehomes	0	0	0	4	28	32
SRO Units[a]	0	0	187	0	0	187
Total	3	4	261	241	384	893
Major Damage[b]						
Dwellings	6	14	150	405	1,653	2,228
Mobilehomes	35	14	0	0	251	300
Total	41	28	150	405	1,904	2,528
Minor Damage						
Dwellings	1,740	390	740	5,612	1,452	9,934
Mobilehomes	74	92	0	206	333	705
Total	1,814	482	740	5,818	1,785	10,639

[a]Single-room-occupancy hotel rooms occupied by community residents

[b]Major damage includes all structures not destroyed but sustaining estimated damages greater then $10,000. Source: Santa Cruz County, Office of the Chief Administrative Officer, February 1990.

had unbraced cripple walls, or had post and pier foundations, and almost all the failures involved structures not built to current seismic standards.

Many wood frame residential structures in the Marina District of San Francisco failed. Typically these structures were four-story buildings, with soft first stories having multiple openings for garages and little or no cross bracing. Failed structures were often located on the corner of the block, where there were fewer adjacent structures to provide support. In many cases, inadequate maintenance, including unrepaired termite damage, contributed to these failures. The most common type of failure was collapse or large distortion of the first story, which, in some cases caused the structures to topple into the street. The rupture of a gas line at one Marina location resulted in the spectacular fire seen live on international television.

Other widespread but less dramatic damage to residential structures was from unreinforced chimney collapse and cracking to walls and ceilings.

In Monterey and San Benito Counties, several reinforced concrete cannery warehouses were damaged by toppling inventories of stored cans which crashed through walls and caused other damage.

HOSPITALS

Few hospitals sustained major damage, although Watsonville Community Hospital nearest to the epicenter suffered both stress fractures and floor settlement. The hospital will be replaced. There was structural and nonstructural damage to the the Veterans Administration Medical Center in Palo Alto, early estimates for repair approximating $200 million dollars. A seven-story tower at Oakland's Peralta Hospital (constructed in 1927) also suffered major damage.

In other hospitals most damage was nonstructural or involved systems-disruption. Many problems were identified involving inadequately anchored generators and fuel tanks, broken fuel lines, insufficient fuel supply, or improperly mounted controls. Failure of community water systems, coupled with lack of backup supplies, curtailed operations of several facilities. Several reports indicated that some equipment vital to proper diagnosis and treatment could not be used because they were not included in the critical emergency circuits.

Elevator cabs and counterweights jumped out of their guides, and elevator motor sets and/or guide rails were not securely anchored, putting elevators out of service and causing significant damage to the system. In a few cases, critical hospital operations were curtailed due to failures of hospital communications systems. In addition, many improperly anchored chillers, air handling units and other mechanical equipment located on facilities' roofs were knocked off their supports and sent sliding across the roofs, causing significant damage. In a few facilities medical gas storage systems sustained damage due to poor or inadequate anchorage. Numerous facilities also suffered nonstructural damage due to inadequate storage and poorly anchored shelving, spilling medical records, laboratory chemicals, equipment and pharmacy medications.

SCHOOLS

Following the earthquake many public schools in the disaster area were closed briefly as a precautionary measure or for lack of utilities. Most of the schools reopened soon after inspection by qualified structural engineers and school district maintenance personnel. Sixty-four school districts reported damage. Most damage was limited to nonstructural building elements such as falling ceiling tiles and light fixtures, broken water pipes and heating ducts, cosmetic cracking of plaster, minor cracks in walls, floors, ceilings and stairwells, loose roof tiles and cracked chimneys. Two school buildings suffered significant structural damage, and may need to be permanently closed.

The Loma Prieta Elementary School, located near the epicenter, experienced significant

damage to only one of its half dozen buildings. There was however, a tremendous amount of movement and damage of building contents. Ironically, recognizing the potential seismic risk, prior to the October 17 earthquake the school district had been seeking an alternative site for the Loma Prieta Elementary School.

The low level of structural damage to public schools protected by the Field Act of 1933 and related California legislation stands in stark contrast to the damage observed in older buildings owned by the major universities, which are not required to consider the earthquake resistance of older buildings. Stanford University, for example, sustained an estimated $160 million in damage; the California State University System had an estimated $18 million in damage; and the University of California suffered an estimated $33 million in damage.

TRANSPORTATION

Older, elevated double-decked freeways constructed of reinforced concrete fared poorly. The most dramatic failure involved the upper deck collapse of a 1.5-mile section of the elevated and double-decked Interstate 880 Cypress Street viaduct in Oakland. In San Francisco several major arterials were severely damaged and remain closed, including the Central Freeway, Interstate 280 (San Francisco, Army Street overcrossing) and Interstate 480 (Embarcadero Freeway). Their loss profoundly hampers the flow of traffic and continues to necessitate lengthy detours. Decision-making about whether to repair and retrofit or replace these structures has been difficult. There is large professional and public uncertainty about both the effectiveness of available retrofitting methods and the costs associated with various alternatives. The Embarcadero Freeway has been torn down.

Other major transportation arteries were severed temporarily, including Interstate 80 (Oakland–San Francisco Bay Bridge), Interstate 980 (Oakland), and State Route 17 (Santa Clara and Santa Cruz Counties, in the vicinity of Summit Road). All of these arteries were already operating beyond their design capacities during commute hours.

Rail transportation was generally slowed for several days while rail lines were inspected. In the vicinity of Watsonville the railroad suffered substantial failure where the tracks subsided and a bridge was damaged.

Following the earthquake closure of the Oakland–San Francisco Bay Bridge, the Cypress section of I-880, Highway 17, and other key arteries severely impacted Bay Area commute patterns. The inconvenience of the one-month loss of the Oakland–San Francisco Bay Bridge was only partially offset by extending operating hours of the Bay Area Rapid Transit (BART) system to 24 hours a day, and by adding new and extra ferry runs across San Francisco Bay.

AIRPORTS

Oakland International Airport and the Alameda Naval Air Station each lost several thousand feet of runway, limiting the size of aircraft that could use these fields. The San Francisco International Airport (SFO) suffered substantial nonstructural damage, including power loss that disrupted air operations. About 80 percent of the terminal floor area was covered with debris. The windows in the control tower blew out, although this did not curtail operations. San Jose International Airport sustained very little damage and remained fully functional to accommodate its own scheduled flights and many flights that were diverted from the partially closed Oakland and San Francisco airports.

UTILITIES

Over 1.4 million electrical customers lost power when the earthquake struck. Within a day or two, power was restored to all affected locations except those few most heavily damaged. Three substations sustained major

damage, along with disrupted transmission lines. Several electrical generation units experienced minimal damage. There was also minor damage to local distribution systems in various locations within the earthquake impacted area.

Broken natural gas lines resulted in gas leaks throughout the impacted area. Initially, gas leaks were controlled by shutting off main systems until building-to-building inspections could be conducted to locate and repair leaks. Over 150,000 customers were without gas. The underground gas distribution system in San Francisco's Marina district was severely damaged and completely replaced within a few weeks. In Watsonville, there was widespread damage to gas line connections at homes and mobile homes, and three of the leaky gas incidents caused structural fires.

Throughout the declared disaster area, some water supplies for drinking and fire fighting were disrupted due to broken water mains and electrical power loss. Loss of electrical power created a demand for potable water supplies in Santa Cruz, Watsonville, Hollister, and Pajaro. Filtration/treatment systems had to be procured and transported from outside these communities. Water pumping and distribution systems were totally destroyed in several communities in the Santa Cruz mountains, which are served by small local water companies. The East Bay Municipal Utilities District (EBMUD) reported over 200 main breaks and leaks and in Alameda, liquefaction resulted in multiple breaks of both main and service pipelines.

A power failure interrupted wastewater flow into the EBMUD treatment plant for five hours. Power failure and sewer line breakage also resulted in raw sewage overflow into Monterey Bay.

The Department of Water Resources, Division of Safety of Dams reported damage to twelve dams located within twenty-five miles of the epicenter. Most of the damage was considered minor, however a few dams experienced severe cracking, and in some cases reservoir levels were held low until repairs could be made. Partially due to the drought-related low water levels, none of the damaged dams posed a risk to downstream residents following the Loma Prieta earthquake.

The telephone communication system survived the earthquake. No major cable facilities were lost, but the network experienced overloading due to the influx of calls. In an effort to ensure that emergency calls within the disaster area got through, long distance companies were requested to block incoming calls.

Emergency Response

The immediate responses of officials and the affected public were extremely effective in curtailing life-threatening situations. By and large, this effectiveness was attributable to the relative dispersion of damage pockets throughout the large region. Consequently, local capabilities were sufficient to meet the need for emergency response. Many officials also lauded the value of continuous planning and regular practice in exercising the plans.

Testimony from many officials, however, indicated their belief that even this simultaneous series of local disasters stretched available capabilities. Not surprisingly, the relative effectiveness of emergency response tended to be correlated with the relative level and geographic distribution of damage. For example, Watsonville was both hard hit by the earthquake and severely challenged by emergency response demands.

> *When the earthquake itself hit, we'd been preparing ourselves for years on how that might feel. And it wasn't anywhere near how I thought it would be. I knew, from the sound of it and feel of it, that it was one of those that you didn't just start to get ready to get under the table; it was one of those that you definitely got under the table for. And I remember a couple of sights.*
>
> *One was that a gentleman in a wheelchair couldn't get under the table, and all he could do was hold a book on his head and pray that the building wasn't going to come down around his*

ears. And I remember the long hours considering the handicapped in disasters. And I've got to put to mind what message we're going to deliver to these people that are caught in that circumstance for the future. Can they be—roll themselves into a doorway, or be prepared to do things that the rest of us, from the stand point of our own protection, can do and they can't do? How do they deal with that?

Secondly, I was very happy that the fire station itself had been earthquake-proofed as a part of the early disaster preparedness. Water heaters were all strapped down, oxygen bottles were strapped down, things—bookshelves, computers, and things like that were held down in place with some preparations the guys had done prior to the earthquake. And so, one door stuck, and that was the only thing that we really had go wrong with our building itself. Some telephone lines dropped, and the guys were able to pull them out of the way without hazard. They got the equipment out, and then it was ready to go to work.

Everybody was in that state of shock which you tend to get in when a disaster occurs. It's like an eerie feeling, like "Now what do we do?" And instincts took over. I looked across the city, and I could see the dust rising from Main Street and the columns of smoke beginning to develop throughout the city.

And in our disaster plan, we had set priorities for response. Our first priority is to respond to the most life-threatening fire and deal with the fire situations first; secondly, hazardous materials, because, in our minds, there's only one department that really can handle those two things, with the tools and equipment and the personnel that we have, and if they aren't handled, they lead to much worse situations, left untouched.

Rescue and medical emergencies—medical emergencies and rescue actually are our third and fourth priorities, medical emergencies because they can be life-threatening and obviously need attention, but there's a lot of medical people available to deal with that, once they get their heads about themselves.

And in this case, Salud Para La Gente, in the downtown area, set up a field clinic in our plaza and treated a great number of the victims that were injured during the earthquake.

I only wish we had had coordinated that prior to the disaster so we would have had a better handle on the capabilities our community had in dealing with those kinds of issues.

There was a tremendous pull on the part of the emergency responders to want to stop and help these people. I mean, they were—the engines were being—people were trying to stop them because there were injured people in the streets, and this was their only sign of help, but they had to keep the priority in mind, in that the fires were still going. And some of our younger firefighters had a real difficult time dealing with that, as they watched people watching the engine go by, without them being able to stop and help.

Once they got to the fires—it seems like we should have prepared for this, and maybe subconsciously, we had, but physically we hadn't—once we got on the scene of the fires, our water system was gone. And the worst areas where you're going to have the majority of fires is also where your worst enemy is from an earthquake, it's going to take the water system.

And you've got to compile all those worst-case situations into an agenda that we can plan around for the future.

Gary Smith, Chief
Watsonville Fire Department
Emergency Services Director

Even though this earthquake was not catastrophic and required only minimal resource support from State and federal agencies, State and federal response systems were activated to provide assistance as necessary. Each affected jurisdiction activated its Emergency Operations Center and responded with its own resources, supplemented by regional and State mutual aid assistance. As in previous earthquakes, spontaneous volunteer actions were a crucial element of local response. Individual efforts in search and rescue, firefighting, first aid, and traffic control saved many lives in the first critical hours after the

earthquake. Generally speaking local emergency responses were effective in minimizing further losses of life and property, but the Loma Prieta earthquake should not be considered a good test of this capability.

It is important to recognize there are some emergency response systems that worked effectively on October 17th which could easily be overwhelmed in an even slightly larger event, or in an earthquake in which the epicenter was closer to heavily populated areas, or in which the strong ground motion lasted just a few more seconds.

Richard Andrews
Chief Deputy Director (now Director)
Governor's Office of Emergency Services

SITUATION STATUS INFORMATION

A recurrent theme in the testimony was that the lack of timely official information about the situation status hampered effective operations in the hardest hit areas of Los Gatos, Santa Cruz, and especially Watsonville. Initially, the media were the only source of information, and in the several hours immediately after the earthquake, the media focused almost exclusively on the dramatic Cypress viaduct and Bay Bridge failures and the San Francisco Marina district fire. These isolated incident reports gave the impression there was terrible, widespread damage throughout the Bay Area. Consequently, several key emergency response officials felt they were "on their own," leading them to make no requests for much-needed outside help. In several cases the media themselves were confused.

Our communication initially really didn't happen. It wasn't through the media—they had no idea we'd been hit. We assumed at that point—really until about eleven o'clock that night, that we were on our own, that we really had no assistance from anyone. We really had to assume that the entire Bay Area was hit as badly as we were. By the next day the media was providing information about us to our community and vice versa.

Deborah Acosta
Town Manager
Town of Los Gatos

As far as finding out what was going on, we were in the same void. When the quake hit, our station was thrown out of power also, and there was no communication phonewise with the assignment desk, but we did have two-way radio. And from what I heard from the assignment editors on the scene, they didn't have any information from officials. They couldn't get through to lines at the police department, the fire department, or any of that, so they were relying on us for what we saw and was able to give back to them.

Mark Richardson
KTVU Channel 20
Oakland

STATE MUTUAL AID SYSTEM RESPONSE

In response to local requests, approximately 80 pieces of fire equipment, including three heavy rescue vehicles, were sent through the OES fire mutual aid system, and an equivalent number through the California Division of Forestry and Fire Protection were dispatched to earthquake-related incidents. The law enforcement mutual aid system provided a variety of resources, including approximately 175 personnel and 32 search dog teams. The coroners' mutual aid system provided 22 coroners particularly to Alameda County (to deal with collapsed Cypress St. structure victims).

In addition to the fire, law, and coroner mutual aid systems, OES provided volunteer assistance for rapid assessments of damaged structures. This program uses volunteers from professional engineering organizations to supplement local expertise. In the week following the earthquake, OES received requests from eight jurisdictions for 600 damage assessment engineers. This was the first field

application of the newly developed *Procedures for Post-Earthquake Safety Evaluation of Buildings,* developed by the Applied Technology Council under contract with OES and the Office of Statewide Health Planning and Development (OSHPD). Development of this manual was partially funded by FEMA. These procedures had been published only one month prior to the Loma Prieta earthquake, and training in their use had only started.

Also for the first time in a California disaster, State medical and health mutual aid assistance was activated. The Emergency Medical Services Authority and the Department of Health Services filled medical/health supply and personnel requests from Santa Cruz County. Emergency Medical Services personnel, trained in Critical Incident Stress Debriefing, were also recruited from unaffected regions of the State to provide mental health services to earthquake responders. There was also informal mutual aid from volunteer professionals including mental health practitioners, building inspectors, and attorney members of local bar associations.

SEARCH AND RESCUE

Search and rescue efforts following the Loma Prieta earthquake were confined primarily to three sites: the I-880 Cypress St. viaduct collapse in Oakland, the San Francisco Marina district building collapses, and the Pacific Garden Mall URM collapses in the City of Santa Cruz. At all sites, the initial rescues were made by on-scene volunteers.

FIRES

Fire departments throughout the impacted areas experienced difficulties due to broken water mains and electrical power loss. Fortunately, the total number of postearthquake fires was limited, and all were brought under control within a few hours after the earthquake. Extremely favorable, unusually light wind conditions aided firefighters' efforts to prevent conflagrations.

The greatest number of fires was reported in San Francisco, where 27 structure fires occurred in a variety of locations, with the most serious being in the Marina district. Redundancy in water delivery systems, which has been a major focus of San Francisco Fire Department (SFFD) earthquake-response planning, paid off in this event. Breaks in both the municipal water system and the high volume auxiliary water system inhibited initial firefighting efforts causing SFFD to resort to other backup systems. Water was drafted from the Palace of Fine Arts Lagoon and relayed to the site. Within an hour after the earthquake, the SFFD portable water supply system was activated, with the Fireboat Phoenix pumping water from the Marina Lagoon. The fire was brought under control within three hours, and the quick response of volunteers who assisted in carrying and using fire hoses until support arrived is credited with preventing further spread of the fire. SFFD recalled 300 off-duty firefighters immediately following the earthquake, some of which were transported by helicopter under agreements made previously.

Several small structure fires were reported in Oakland but were brought quickly under control. There were also several fires associated with the I-880 Cypress Street viaduct collapse. A major fire in Berkeley—originally reported by the media to involve the public library—occurred at a towing service garage. It required all the resources of the Berkeley Fire Department to bring this fire under control.

Santa Cruz County reported over twenty fires, with only one reported in the City of Santa Cruz—that totally destroyed a single family residence. Watsonville reported three structure fires—one involved a single family residence, and the others destroyed two mobile homes. These fires are believed to have started because gas lines were severed when the homes slid from their pre-earthquake locations. Due to water main breaks, the Watsonville Fire Department experienced difficulty in fighting these fires. The department had no water tankers or water pools

to draft from. Fire control was achieved by plotting locations of gas-fed fires and requesting Pacific Gas and Electric Company to do emergency shut-offs. In the Redwood Estates area of Santa Clara County, a residence fire was ignited by a ruptured propane tank. Because the community's entire water distribution system was destroyed, the fire was fought by drafting water from the community swimming pool.

HAZARDOUS MATERIALS

The only major hazardous materials spill was at the UNOCAL oil refinery, involving 840,000 gallons of unleaded gasoline. This spill was quickly handled by UNOCAL with assistance of the Richmond Fire Department, the Coast Guard Marine Safety Office, and Coast Guard Strike Teams. Another smaller spill at the Kelly Moore facility in San Mateo County involved 100,000 gallons of latex paint, which spilled into San Francisco Bay. Sloshing of the contents of open vessels caused several hazardous-materials incidents, but secondary containment prevented materials from escaping to the environment.

COMMUNICATIONS

The event of this quake underscored several important factors that are known to emergency services personnel and planners. And of them, number one, when the quake struck, water mains broke, gas mains broke, fires occurred, buildings collapsed, people were trapped in buildings by—and struck by falling debris on the streets, emergency agencies were swamped with calls, and emergency communications systems in effect broke down due to overload, and the coordination between the agencies and utilities during the event, because it became so overwhelming, became fragmented.

Frank Blackburn
San Francisco Fire Department

The telephone communications system in the Bay Region sustained little damage, but emergency measures taken to control line load affected emergency communications. To prevent damage to the system from overload the telephone companies block incoming calls, thus reserving more service for outgoing calls. Because the disaster area involved more than one area code, it was extremely difficult for the OES Region 2 office in Pleasant Hill to communicate by telephone with heavily impacted jurisdictions in the southern counties, especially Santa Cruz.

Back-up emergency communications systems functioned quite well in filling the short-falls of the telephone system, although individuals assigned to monitor several telephone lines, as well as radio receivers, could not physically respond to all incoming communication attempts.

Although California response agencies own a rather limited number of cellular telephones, the cellular phone system was partially effective in supplementing field communications. In the days following the earthquake however, Cellular One, a cellular telephone company, donated 200 portable battery-powered cellular telephones to emergency response personnel for unlimited free usage. The principal problem in using the telephones was saturation of the cell when more than a dozen telephones were in use in one place (e.g., the Cypress St. viaduct collapse).

EMERGENCY PUBLIC INFORMATION

One of the other things we learned was about the media—they're going to be a key player in actually responding to an event. We've realized that we have to get the news out, especially if it's good news. Good news wasn't coming out very clearly.

Thomas Mounts
Emergency Preparedness Officer
City of San Jose

As expected in an earthquake like Loma Prieta, local television and radio stations focused primarily on covering the event, rather than on providing emergency public information. In addition, the broadcasts painted an uneven picture of the location and extent of earthquake damage. Emergency public information activities following the earthquake were more responses to inquiries by the media than as use of the media to communicate important information to those persons inside and outside the impacted area.

The Loma Prieta earthquake disaster immediately attracted the attention of worldwide news media that were present in the Bay Area for the World Series. Local and State agencies in the affected areas dealt with on-site media who flocked to the various damage and emergency operation center locations. The State Office of Emergency Services (OES) activated its Emergency News Center, which was staffed around the clock throughout the response phase by nearly 50 public information officers from various State agencies, under the direction of OES.

Conclusions and Recommendations

In formulating recommendations based on the Loma Prieta earthquake investigation, the Commission reviewed the range of actions suggested by the many local officials who testified before the Commission. The suggestions include ways to reduce the destruction in future earthquakes, and ways to deal with immediate postearthquake public service demands. These recommendations are coupled with more specific conclusions of the Commission's committee on emergency response.

Shortly after the Whittier Narrows and Loma Prieta earthquakes, the Emergency Planning and Response Committee of the Seismic Safety Commission undertook an assessment of California's capacity to respond to major urban earthquakes. The assessment found California is basically not adequately prepared for these expected events. The committee outlined major actions to be undertaken immediately to help remedy an emergency response shortfall that, unless met would increase the impact of a devastating disaster.

EARTHQUAKE HAZARD MITIGATION

Voluntary hazard mitigation is limited by several factors; but primarily by personal risk denial, and competition for scarce funding resources. The Commission supports many of the recommendations made at the hearings and in other forums. Generally, the officials who testified recommended the following types of activities:

- Public education about earthquake risks, methods of hazard reduction, and preparation of households for emergency response and short-term relief
- Development of earthquake-resistant construction techniques, and codes and standards for upgrading existing buildings
- Extension of seismic retrofitting requirements to all structures, including homes built before seismic safety codes were enacted
- Requiring mobile homes to be braced to resist seismic forces
- Identification of areas of high earthquake risk for zoning and permitting processes
- Development of policies to mitigate potential damage to essential and high occupancy facilities in high risk areas

Specifically, officials from the three communities where homeowners sustained much damage to older single family homes urged the State to require their appropriate retrofitting. An official from the community where mobile homes were most severely damaged recommended that the state require their appropriate bracing. These actions would not only reduce damage and repair costs, but would also reduce the potential for fires. When these unanchored single family and mobile homes shift during an earthquake, they often

sever utility gas lines, and gas leaks are a major source of postearthquake fires.

IMMEDIATE AND SHORT-TERM RESPONSE NEEDS

Local officials caught up in survival response cannot be expected to give the State immediate assessments of the total picture or make precise requests for equipment and personnel. Consequently, the State OES should be authorized to send resources to the areas impacted by an earthquake automatically and without delay. We already know there are sure to be immediate demands for fire engines, water tenders, portable water mains, rescue equipment, and many emergency response personnel.

The State should also require a minimum number of routine emergency response exercises, with State participation and review. In several cases, communities reported that recent practice with their plans, as well as the August 1989 State/federal Response '89 exercise, made a very positive contribution to effective and timely response immediately after the Loma Prieta earthquake.

Several officials reported that the ATC-20 rapid damage assessment method and OES's volunteer inspector program were very important and helpful. At the same time, however, needed improvements in the method and the program were suggested. A system for accurately posting damaged buildings is needed, capable of using all appropriate languages. The system should be universally adopted and qualified persons, including out-of-town inspectors and structural engineers, should be trained in the inspection and posting procedures, to reduce inconsistencies and confusion. The posting forms should be easy to use and structured for compatibility with computer data management systems.

The State should develop guidance on procedures to inform building owners and tenants of options for access to damaged buildings. Procedures for obtaining inventories and personal belongings need to be included. The guidance should be developed in consultation with local emergency services directors, city attorneys, State OES, and FEMA representatives.

Recommendations by the Emergency Planning and Response Committee of the Seismic Safety Commission are summarized below under five headings: emergency management system; communications; mass care and shelter; medical services; and training.[4]

EMERGENCY MANAGEMENT SYSTEM

There is an urgent need to enhance, expand and improve California's current Emergency Management System. The system should be standardized, integrated, understood and accepted. It must be organized from cities to counties to State Regions, and finally to the State Operations Center and state agencies. It should consist of existing, functioning day-to-day organizations. Parts of this system are currently in place and functioning with differing degrees of standardization and effectiveness. To accomplish this, several recommendations are suggested, as follows.

- Emergency Management Operational Area Organizations should be mandated and implemented for all cities, counties, and State Regions.
- OES should conduct an extensive training program in the concept, organization, functions and operating procedures of Emergency Management Operational Areas to help develop a standardized Emergency Management System for all California governmental emergency organizations.
- The Governor's Office of Emergency Services (OES) should encourage all cities, counties and Operational Areas to enter into statewide mutual aid agreements

[4] From "Earthquake Emergency Preparedness and Response: A Report to the Seismic Safety Commission." Emergency Planning and Response Committee Report, October 17, 1990.

within the framework, organization and operational procedures of the State Emergency Management System. Those mutual aid agreements should provide for jurisdictions located outside of expected disaster impact areas to contribute emergency management and administrative mutual aid.

COMMUNICATIONS

The potential for interruption of radio and telephone communication systems should be reviewed fully and comprehensively, analyzing the role of satellite communications and the impact of piecemeal implementation of the 800 Megahertz (800 MHz) communication systems on mutual aid response capabilities. Saturation of cellular phone cells should also be included in the overall assessment. The following recommendations were made.

- A state evaluation of the emergency communications capabilities of emergency management and response agencies throughout California should be conducted and maintained. The evaluation should identify emergency communication networks and frequencies and should evaluate system compatibility and survivability. Saturation of cellular telephone cells should also be investigated.
- Duplicate and alternative emergency communications systems should be developed to insure survivability. Alternate systems, at State and local governmental levels, should consider and include satellite, HF/VHF/UHF radio systems, cellular telephones, amateur radio, fax machines and computer data networks.
- Local government and media partnerships should be developed in order to insure the dissemination of timely emergency information to the general public, and also to establish procedures by which disaster information obtained by the media can be communicated back into the emergency management system.
- Partnerships should be established between local operational area emergency coordinating points and local utility lifeline service providers. Those partnerships must be supported with survivable communications.

MASS CARE AND SHELTER

Additional organizations need to be brought into the process of planning for and providing emergency care and shelter. For needed advances in mass care and sheltering capacities, the following recommendations are made.

- Agreements between state and local governments, the American Red Cross and other agencies responsible for care and shelter, need to be developed or updated where they already exist. They need to be incorporated into existing disaster plans to be followed by training and exercises to ensure all parties understand their roles and responsibilities.
- Mass care and shelter providers must recognize the need, and provide for, both short and long-term sheltering following a major emergency. The shelters must be identified and designated before the next earthquake. Sites and facilities to support tents and other temporary structures must also be included.
- A statewide mass care and shelter mutual aid system which provides access to supplemental shelter management staff and to resources must be developed and implemented. The system must be available for activation at different levels of earthquake impact and should incorporate staff and resources of relevant State departments including Social Services, Health Services, Mental Health and others as appropriate.
- Mass care and shelter providers must plan and prepare to service the needs of the wide variety of people that live in California. To help meet these needs,

liaison personnel from these diverse populations must be identified in advance and given emergency management orientations before the next earthquake. These liaison personnel must be involved in planning, be part of the response systems, and be activated immediately following an earthquake to participate in identifying and solving problems as they arise.

MEDICAL SERVICES

Hospitals and other medical care facilities should be better prepared to survive earthquakes and participate in subsequent response activities. A Medical Mutual Aid system must be developed and implemented in California with standardized procedures, protocols, and communication systems agreed upon. The committee outlined five relevant recommendations.

- Hospital earthquake response plans must include provisions covering the potential for simultaneous internal and external disaster responses, (hospitals may be both victim and a responder in a earthquake).
- The State Emergency Medical Services Authority must continue to pursue improvements in emergency medical services communications at both state and local levels. This must include the development of a statewide medical administrative or mutual aid communication frequency.
- The State Emergency Medical Services Authority must continue to provide guidance and encouragement to all emergency medical service agencies in the State by promoting the development of Mutual Aid Agreements, resource directories, and financial agreements.
- The Joint Commission on Hospital and Health Care Accreditation and the Office of Statewide Health Planning Development (OSHPD) must require nonstructural earthquake hazard mitigation in all California hospitals and health care facilities.
- The State Emergency Medical Services Authority, in conjunction with California Hospital Councils, must offer and sponsor courses on nonstructural earthquake hazard mitigation for all hospitals and health care facilities.

TRAINING

Training of emergency managers and responders, particularly at the state, regional and local levels, needs greater emphasis. The following recommendations suggest improvements in training for emergency response.

- The Governor's Office Emergency Services (OES), as lead agency, and with the assistance of local government, should undertake a project to evaluate current training programs. Training requirements and guidelines should be established that are flexible, and can be responsive to the specific conditions and circumstance of local jurisdictions.
- The California Specialized Training Institute (CSTI) should provide local jurisdictions with training programs that are tailored to specific jurisdictional threats, and utilizes the management organizational structure and facilities of the jurisdiction.
- A training program should be designed and implemented, which provides for on-site training of not only OES Emergency Management personnel but the entire statewide emergency management community as well. Where systems are found to be incomplete, first priority should be given to the comprehensive development of the system.
- The Governor's Office of Emergency Services (OES) should participate in a professional certification program for emergency managers and should require that it be implemented for all State and

regional emergency management personnel and for all local governmental personnel directly funded under the Emergency Management Assistance (EMA) program.

Chapter 3

Recovery Issues

Overview of the Recovery Process

Although earthquake recovery involves all sectors of a community, local governments have the major responsibility of managing postearthquake recovery and reconstruction, an overwhelming and unanticipated burden. An earthquake changes a community's agenda and priorities for several years, and local decision-making is often constrained by the regulatory limitations of disaster assistance programs.

The most difficult issues emerge when the initial emergency period is over. While they resemble many that local officials deal with regularly—e.g., economic development, land use, housing, redevelopment and building standards—the environment is radically different. Public safety concerns and eagerness to return to normal quickly push the process and may limit the time available for decisions, but this can still be painfully slow and drawn-out.

It is commonly agreed that rebuilding after a major earthquake falls into three or four phases. (1) The first month is generally devoted to preliminary damage assessment, clearance, very temporary housing, and emergency shoring or repairs. (2) The remainder of the first year largely involves demolition, providing temporary housing and facilities for dislocated businesses, and making more extensive repairs of minor damage and of public infrastructure and public facilities. (3) It then takes two to four or more years to complete more permanent reconstruction projects such as permanent housing and other buildings. (4) Some observers say that it can take up to ten years for a community to recovery fully, that is to arrive to the level of vitality it would have enjoyed if the disaster had not occurred.

In light of this pattern, it should not be surprising that the reconstruction process had barely begun, 20 months after the Loma Prieta earthquake. For instance, of the 34 buildings demolished in downtown Santa Cruz, one had been replaced. In downtown Watsonville, none of the 22 demolished or severely damaged and unoccupiable buildings had reopened or been replaced. In Oakland, 450 very-low-income victims were still housed in what amounts to temporary shelters. Any complete study of Loma Prieta earthquake recovery and reconstruction will therefore need to follow the process for a few more years. There may be important policy lessons from this experience which the Commission should continue to observe. Several overriding issues have already emerged and can be articulated now. The dominant issue is housing.

Housing Replacement

It has often been observed that disasters tend to reveal, and speed up the development of, ongoing social and economic trends in a community or region. This earthquake dramatically exposed this tendency and revealed the ugly reality of the low-cost housing shortage in the greater San Francisco Bay Area.

A recent Association of Bay Area Governments report indicates there is a 57,000 low income unit shortage in the bay area. Currently there are 15,000 people on an Oakland public housing waiting list, and of the 50,000 very low income persons that do have housing, 43,000 of them are paying well over

30% of their income for rent and many pay 70% of their income for rent.

The low-cost housing shortage is a statewide problem, and unfortunately, a highly disproportionate number of low- or fixed-income persons live in the state's older, most vulnerable buildings. The postearthquake housing situation in Santa Cruz County is a microcosm of the regional problem for vulnerable housing. The problems revealed by this earthquake dramatically underscore what should be expected when the major urban earthquakes occur in California. The following testimony of Luther Perry (Santa Cruz County Housing Task Force) illustrates these points.

Our best estimate is that we have something on the order of 3,000 people without homes. To give you a sense of how that might look percentagewise, those destroyed and major-damaged housing units correspond to about 3-1/2 percent of our entire housing stock.

In the Cities of Santa Cruz, Capitola, and Scotts Valley, the housing loss was relatively less, approximately one percent of their housing stock. In the City of Watsonville, it was about 8 percent, and in the unincorporated part of the county, where there was a wide variation, the average was about 4 percent.

Now, numbers like 1 and 4, and even 8 percent of housing stock, are not—they're not real big numbers until you put a little bit more perspective on it. In all parts of the county, our typical apartment and house vacancy rates, before the earthquake, were in the vicinity of one percent. What that means is, in the Cities of Santa Cruz, Scotts Valley, and Capitola, the number of dwelling units that are out of service is approximately the same as the entire pre-earthquake vacancy rate.

And, of course, there's not an even match between houses that are lost and ones that are available that are vacant.

In the City of Watsonville, the number of dwelling units off-line, the number of families out in the cold, represents something like 800 percent of the vacancy factor in that town. That gives about eight families looking for every vacant unit.

The stories that you heard earlier about people living two and three families to a house, people living in garages, that is very strongly true in the Watsonville area, and it is those buildings that took the heaviest damage. So, retrofit on older frame structures is a significant issue, and Watsonville demonstrates that in spades.

Also, over half of the mobile homes that are off their foundations are in the Watsonville area. In most of these cases, the mobile homes are off their foundation so spectacularly that it's interrupted the utility service and has supports sticking through the floors of mobile homes. Yet people continue to attempt to occupy those, because they would rather live there than have to go into a tent or out into the cold.

I don't know what kind of magic to offer, but if there are procedures or approaches or construction practices that keep mobile homes from being thrown off their foundations, that would be 500 units of housing, right there, that had significant to major damage—we could be saving a lot of grief for a lot of people, and particularly for a very vulnerable population, the elderly population.

The second major problem are those downtown, single-room-occupancy (SRO) hotels in Santa Cruz. Like almost every city in this state, those are older hotels—they're no longer economical for other purposes, and they're converted over for single-room occupancy, either among people who are one step above being street folks, or for older people who not only are on limited income, they're on poverty income.

So, we have 400 people who, just like that, they have no place to live, the buildings are in the fenced-off areas, red-tagged. These are primarily elderly people, impaired folks, or people who have a history of mental or alcohol type problems. They were living in a stable situation, and now suddenly they're out on their ears.

I think there's a lesson here, that when you have a very strong earthquake and you are as close to the epicenter as we were here—the loss of housing units is indeed very much larger than anyone had led one to believe would be the case.

And I think the lesson here in Santa Cruz is that it may be possible to identify specific housing situations that are at much higher risk than usual: the older houses, housing in liquefaction areas, the single-room-occupancy hotels, and all those people up in the mountains. Those are very specific risk areas that are quite a bit different from just houses in general.

COMMISSIONER WASTE: Well, it occurs to me that you need to dramatize this thing a little bit. When the number of 8 percent in Watsonville translates out to Los Angeles, where this is going to happen too, we are now talking about a quarter of a million, at least, homeless. And what are we going to do with that?

INADEQUACIES OF ASSISTANCE TO REPLACE LOST HOUSING

After the Loma Prieta earthquake, the Congress requested one of its research units, the U.S. General Accounting Office (GAO) to investigate the adequacy of the federal response to both the earthquake and Hurricane Hugo. Of particular interest here is the GAO's identification of postdisaster housing replacement as one of the major problems that the Congress and federal agencies must address. Following is a summary of the GAO's study of housing replacement, based on the GAO's report *Disaster Assistance: Federal, State, and local Response to Natural Disasters Need Improvement* (March 1991).

According to the GAO study, the Loma Prieta earthquake was the first large-scale disaster in a major urban area where the problem of repairing or replacing low-income housing occurred. The Loma Prieta earthquake struck an area that had a serious shortage of affordable rental housing for low-income residents[5] and a low vacancy rate for all housing.[6] According to Department of Housing and Urban Development (HUD) statistics, the earthquake destroyed about 1,000 low-income units and caused major damage to another 3,000 low-income units.

Most of these privately owned units will not be restored or replaced without government assistance, mostly because the repair costs exceed the revenue that could be generated through affordable rents, according to local and federal housing officials. Although owners of damaged rental housing may have been eligible for SBA disaster business loans, their repayment expenses would generally force them to increase rents, thereby taking the units from the low-income housing inventory. According to FEMA, the Stafford Act does not authorize the agency to restore or replace the damaged units. The GAO study indicates that FEMA believes HUD should be responsible for restoring or replacing permanent housing. However, FEMA did not believe it had the authority to direct HUD to do so, and HUD did not agree to assume the responsibility. Although section 402 of the Stafford Act authorizes FEMA to direct federal agencies to use their authority and resources, with or without reimbursement, to support state and local assistance efforts, FEMA interprets this section as applicable only to short-term emergency disaster needs instead of long-term needs, such as permanent replacement of damaged housing. As a result, FEMA did not request HUD to assist in housing recovery efforts following the earthquake or to provide disaster funds.

In February 1990, HUD Region IX officials proposed using (1) $44 million in federal funds to help rebuild damaged or demolished housing and (2) 2,000 5-year rental assistance vouchers to aid victims while the housing was being rebuilt. However, HUD headquarters did not fund this proposal. HUD allocated 500 rental assistance vouchers and 664 moderate rehabilitation certificates to the earthquake disaster area. It took 4 months to provide the vouchers, and local authorities in one locality

[5] HUD defines affordable rent as not more than 30 percent of income for someone with 80 percent of the median income of the area, adjusted for family size.

[6] HUD considers vacancy rates below 5 percent (4 to 6 percent, depending on the rate of growth in the area) to be low. In areas hardest hit by the earthquake—Alameda, San Francisco, and Santa Cruz counties—vacancy rates prior to the earthquake ranged from 0.8 to 2.9 percent.

had not received the rehabilitation certificates 8 months after the earthquake. The vouchers provide rental assistance to some low-income renters, and the certificates can help restore buildings with minor damage, but neither program addresses the need to replace or restore the destroyed or seriously damaged units.

To help address the problem of repair or restoration of damaged rental units in the Whittier Narrows, the state established a permanent disaster assistance program, the California Natural Disaster Assistance Program for Rental Properties (CALDAP-R), to provide low-interest, deferred loans for rehabilitating these units. To be eligible, an applicant must have first used any available funds from insurance, private financing alternatives, the Small Business Administration (SBA), the Individual and Family Grant Program, administered by the state. Some owners of damaged low-income rental units may receive loans through this program, but because it was designed as a measure of last resort, assistance was very slow to be considered. The conditions on the loans tend to favor projects that are attractive mainly to the nonprofit housing sector.

TEMPORARY HOUSING ASSISTANCE

After the Loma Prieta earthquake, FEMA required victims seeking eligibility for temporary housing assistance to document the fact that they had lived at a particular location for at least 30 days. Victims who shared housing and those living in single room occupancy (SRO) units had problems meeting this residency requirement for one of several reasons: (1) SRO residents often could not afford to stay in an SRO building for an entire month; (2) owners of SRO buildings often did not allow residents to stay longer than a full month, to prevent them from gaining tenancy rights; (3) residents sometimes shared a room with another resident and could not document their own tenancy; or (4) residents had difficulty getting documents from damaged buildings or former landlords. FEMA officials said that only 353 victims qualified for and received temporary housing assistance out of 859 residential units located in the eight severely damaged SRO buildings in Oakland alone.

In November 1989, tenant advocacy groups filed a class action lawsuit against FEMA, charging that FEMA discriminated against low-income victims of the earthquake who occupied SROs or other transient accommodations. In a court-approved settlement agreement, FEMA agreed to replace damaged low-income housing under section 403 of the Stafford Act. Action on the legal settlement was delayed while disagreements between FEMA and the plaintiffs were argued before the court. Eleven months after the earthquake, only one project had been approved for funding. On December 5, 1990, in order to expedite implementation of the settlement agreement, the parties entered into a memorandum of understanding that could require FEMA to provide up to $23.04 million for replacing 2,070 low-income housing units made uninhabitable by the earthquake. Since this was a specific settlement (and not a court case finding) it is not yet known what impact, if any, this experience will have on federal policy after the next major earthquake. This settlement is further described in Section Five, Legal Issues.

The basic conclusion related to damaged housing replacement is that federal disaster assistance programs do not provide adequate assistance to state and local governments to reconstruct damaged rental units. The shortfall in housing assistance was evident in several areas. First, landlords desiring to repair damaged units found that federal disaster loans were not economically feasible for low-income housing. Repayment costs would require owners to raise rents beyond the means of low-income tenants. Second, HUD received no disaster assistance funds, and transfers of other HUD funds to aid disaster victims were minimal and delayed. Third, California's deferred loan programs offer some limited assistance to restoring rental units and homes, but the application approval process is slow and loan conditions are not particularly attractive to private owners of affordable or low

cost housing. And finally, FEMA did not establish a temporary housing assistance program that recognized the need for a longer term housing recovery plan. FEMA's housing assistance requirements and procedures made it virtually impossible for some disaster victims to get temporary housing assistance.

Conclusions and Recommendations

HOUSING REPLACEMENT

The State of California urgently needs to focus on the issue of low cost housing replacement especially when contemplating response to the expected urban earthquakes that are likely to permanently displace tens of thousands. As a starting point, the State should officially follow-up on progress the federal government is making in responding to the GAO's two important recommendations. First, that the Director of FEMA should coordinate with the Secretary of HUD and other appropriate federal, state, local, and voluntary relief agencies to develop a suitable housing recovery plan for low-income victims. The second is that the Congress should either (1) clarify whether section 402 of the Stafford Act authorizes FEMA to direct HUD to assist state and local governments in rehabilitating or reconstructing housing for disaster victims or (2) amend sections of the United States Housing Act of 1937 and the Housing and Community Development Act of 1974 to provide for appropriations directly to HUD to fund housing assistance for disaster victims.

Answers to these questions will provide the framework within which California can launch its own planning process to deal with this difficult issue.

ISSUES OF STATEWIDE INTEREST

Issues that must be dealt with during recovery are quite complicated anywhere earthquakes occur but they are much more complex in modern, heterogeneous urbanized areas, where expected losses and the costs to recover, repair and reconstruct will continue to grow rapidly. The State therefore needs to undertake an effort to develop more knowledge and agreements about how recovery processes can be managed most effectively. Some of the most pressing issues revealed in the Loma Prieta earthquake warrant attention now.

The Commission's objectives for improving communities' abilities to manage the recovery process from major urban earthquakes include airing, discussing and resolving at least the following major issues at the earliest time:

- We need minimum codes and standards for the repair of damaged buildings.
- We need to develop a practical program to expedite decision-making on repairing or replacing unique historic and architectural resources.
- We need viable strategies for replacing lost housing, especially very low-cost, low-cost, and affordable housing.
- We need to make improvements in State and Federal disaster assistance provisions and delivery. The application processes and eligibility criteria for disaster assistance programs need to be simplified and streamlined to expedite assistance to victims.
- We need to know more about the effects of recovery process on regional economies and governments' fiscal health
- We need to know how to create and maintain the sociopolitical climate that will contribute to effective recovery management.

Resolution of these and other issues that will emerge as communities continue their recovery is a matter of statewide interest. Developing practical methods and approaches to resolve these issues are integral to both implementing

local planning efforts and to development of the State plan for earthquake recovery.

STATE RECOVERY PLANNING

The Loma Prieta earthquake highlighted the disruption encountered when damage to public buildings and facilities leads to temporary and long-term closure. The State and its agencies and institutions must now begin preparing plans for their own temporary relief and longer-term recovery in order to minimize the level of postearthquake social and economic disruption both to the communities where state facilities are concentrated and to the state's employees, clients and university students.

Chapter 4

Costs and Funding

Introduction

The Loma Prieta earthquake resulted in approximately $8.0 billion in damage to buildings, building contents, infrastructure, and other direct costs. Indirect economic losses from the earthquake are poorly defined, but they appear to have cost approximately $2 billion dollars. In total, the Loma Prieta earthquake was approximately a $10 billion event which corresponds to about $1700 per person for the six million people in the ten county affected area. The $10 billion dwarfs the economic impact of other US earthquakes, but is still a factor of five to ten smaller than the economic impact expected for large earthquakes in major urban areas. [Based on a 1980 FEMA memo, adjusted for inflation, a M 6.5 on the Inglewood-Newport fault would cause $112 billion in damage.]

This section describes the costs and recovery funding sources for the Loma Prieta earthquake. An overview of the economic impacts of the earthquake is also presented. Data are primarily available on a regional basis and these are augmented, where possible, by local and anecdotal information where such data are helpful in providing for a fuller understanding of the economic impacts of the earthquake. Primary data were not collected; rather, existing information was compiled and analyzed.

Earthquake damage and loss estimates must be interpreted with caution. No agency has the responsibility to compile comprehensive damage and loss information on a consistent basis after an earthquake. Rather, a variety of organizations each compiles fragmentary information based on their own programs and needs. Consequently, there is no well-established process by which comprehensive damage and loss information is systematically collected after an earthquake. Firm estimates from engineering studies may be combined with rough guesses about approximate damage levels. Criteria for assessing damages and assigning values to losses vary widely. There are no uniform standards for the repair of damaged structures which makes it hard to estimate total repair costs. Compilations of damages may be incomplete in some cases and double counted in others.

Damage is defined here as the direct cost to repair or replace buildings, building contents, and infrastructure damaged by the earthquake. In general, data about damages to public facilities are more complete and reliable because there is a public accounting of governmental costs. Private sector damage data—from individuals, to small businesses, to large corporations—are subject to larger uncertainties. The complete reconstruction process—from engineering analysis, to planning, to financing, and to completing construction—may take several years to a decade or more after a major earthquake. Therefore, it may be many years before the costs of replacing facilities that were damaged or destroyed in the Loma Prieta earthquake are fully known.

Other direct earthquake costs include such things as removal of debris, security in damaged areas, disaster response and management expenses, medical costs, and the dollar cost of loss of life. Accounting for some direct earthquake costs is sometimes commingled with "normal" operations, and thus estimates of the extra costs generated by an earthquake are sometimes difficult or impossible to obtain, particularly for the private sector.

Indirect earthquake losses include costs associated with such things as business

interruption losses, lost productivity, relocation, and lost tax revenues. Detailed studies of such indirect losses are not available for the Loma Prieta earthquake. Available indirect loss estimates are crude and are subject to data limitations and specific economic modeling assumptions.

Funding for recovery after an earthquake comes from a wide variety of sources, including federal, state, and local governments, voluntary organizations, and the individuals, businesses and other organizations affected by the earthquake. Public-sector recovery funding data are generally much more precise than damage and loss data, because such funding is formally appropriated, and detailed accounting of expenditures is generally available. Private-sector recovery funding data are sparse, except for selected nonprofit organizations.

The following compilation and discussion of economic losses and recovery funding associated with the Loma Prieta earthquake first reviews damage and other direct losses, followed by reviews of indirect losses, and sources of recovery funding.

Direct Losses

The California Office of Emergency Services (OES) has compiled damage assessments reported by the affected counties for both private and public facilities. The assessments were conducted within two months of the earthquake and they have not been systematically updated since that time. OES now tracks information it needs on a case-by-case basis. The total damage to public and private facilities (excluding federal-aid eligible highways and bridges) was estimated as $5.94 billion (OES, 1990a). Of this total, approximately $1.8 billion is public facilities, approximately $4.0 billion is private facilities, and about $140 million is in undetermined miscellaneous categories. In addition, damage to federal-aid eligible highways and bridges totaled about $1.47 billion (OES, 1990b). Thus, costs due to direct damage for the Loma Prieta earthquake total about $7.5 billion.

Damage estimates for other infrastructure, including airport and harbor facilities; gas, electric, and water utilities; waste water facilities; and telecommunications facilities are poorly defined. Damage at airport and harbor facilities may have been as much as $200 million (SOR, 1989). Reconstruction, restoration and recovery of the gas and electric utility systems may total about $100 million (PG&E, 1989). Total damage to infrastructure, other than highways and bridges may total approximately $0.5 billion. At least some of this damage is included in the OES compilation discussed above, although some of the reporting counties appear to have used incomplete and/or noncomparable criteria for including/ excluding certain facilities in their damage reports.

In addition to building and infrastructure damage, the Loma Prieta earthquake also resulted in other direct costs for debris removal, protective measures in damaged areas, and a host of other response and recovery costs. For the public sector, estimates of debris removal and protective measures total $103 million (FEMA, 1991). No estimates of such costs are available for the private sector. It appears that direct costs other than damage probably exceed $200 million.

The Loma Prieta earthquake resulted in 62 or 63 deaths and 3757 reported injuries (OES 1990a). Based on a statistical value of $1.7 million for a human life (Keech, 1989) and roughly estimating the value of injuries at $10,000 each, the direct human/medical costs of the earthquake may have been approximately $150 million. Thus, the total direct costs of the earthquake, other than damage to buildings, contents, and infrastructure, probably exceeded $350 million.

To examine damage levels in the private sector, there are two additional independent sources, other than the OES estimates: insurance settlements and property value assessments for property tax reduction purposes. According to the California Department of Insurance (1990), insured losses from the Loma Prieta earthquake

totaled approximately $681 million, with about $640 million distributed in four categories: homeowners, commercial, inland marine, and earthquake coverage. Approximately $68 million should be added to estimate the total damage to account for the normal 10 percent deductible. Additional claims are still in negotiation or litigation, and thus total insured losses may be somewhat higher than $681 million. Many, but not all, owners had homeowners or commercial insurance coverage of some sort. However, only about 24% of homeowners had earthquake insurance. Earthquake insurance accounted for about 55% of the dollars paid in insurance claims. Correcting for the *approximate proportion* of owners having earthquake coverage suggests that the total damage that may have been covered *if all owners* had had earthquake insurance may approach $1.5 billion. In addition, many damaged buildings suffered less damage than the deductible dollar amount. Thus total damages would have been higher than $1.5 billion. Overall, this analysis of insurance data indicates that the estimated total private sector damages are roughly comparable to the county estimates provided to OES for damage to private sector facilities.

The number of insurance claims paid is slightly less than one-half of the total claims reported. There appear to be three primary reasons for this. First, some policy holders made claims even though they did not have an earthquake insurance endorsement on their policy. Second, the claimants' losses were for an amount less than the 10 percent deductible. Third, some policy holders had to document that their insurance claim was turned down before they could complete their applications for other forms of disaster assistance, primarily from governmental sources (Roth, 1991).

Property tax assessment values provide a third, independent estimate of private sector damages in the Loma Prieta earthquake. The reported assessed value loss for 1989 was estimated at about $464 million. Assessed values average about 60% of market value; therefore, the corresponding market value loss is approximately $773 million. Undoubtedly, most damaged properties did not reach the 24 percent damage threshold to qualify for assessed value reductions. Therefore, $1.5 billion, or approximately double the estimated market value loss obtained above, may roughly approximately the true property value loss. Furthermore, much of the earthquake damage occurred to building contents, and damage to contents is not reflected in the reassessment of property taxes. Inclusion of damage to building contents would further increase the amount.

Indirect Losses

In addition to direct damage to buildings, building contents, and infrastructure, an earthquake also causes large indirect economic losses associated with such things as: business interruption; lost productivity, wages, and sales; transportation disruption; decreased tourism; and other activities. Decreased tax revenues are also a source of indirect losses associated with an earthquake.

The 1989 Gross Product of the area affected by the Loma Prieta earthquake was approximately *$125 billion (Federal Reserve Bank of San Francisco, 1989)*. Shutting down the entire Bay Area economy for one work day would produce approximately a $500 million loss. Very roughly, the cumulative indirect economic effect of the Loma Prieta earthquake (business interruption, lost productivity, etc.) may have been equivalent to shutting down the Bay Area economy for one or two days and thus resulted in indirect losses of $500 million to $1 billion.

The Loma Prieta earthquake caused major disruption of the regional transportation system, particularly due to the closure of the Bay Bridge and the loss of the Cypress St. freeway structure. These disruptions heavily affected the area for about one month (until the Bay Bridge reopened), and continue to affect the area today because major structures such as the Interstate 880 Cypress viaduct and the Embarcadero Freeway have not yet been reconstructed or replaced. Dames and Moore

(1990) suggested that indirect losses resulted from time lost to traffic delays and delays in the transportation of goods vital to the economy of the affected areas might exceed several billion dollars. Prior to the earthquake, the Bay Bridge carried about 250,000 vehicles per day and the Cypress structure carried about 170,000 vehicles per day. The loss of these key transportation links, and other losses such as Route 17 in the Santa Cruz mountains and the Embarcadero Freeway in San Francisco, clearly had ripple effects that affected transportation throughout the Bay area. If one million commuters were delayed one hour in each direction, and the average value of their time is $10 per hour, then such transportation delays resulted in indirect losses of $20 million per day. Given that the Bay Bridge was closed for a month and other disruptions continue to the present time, a reasonable estimate of indirect losses due to transportation delays must be in the range of $1 billion or more.

The Loma Prieta earthquake clearly had at least short-term impacts on tourism and hotel occupancy in hard-hit areas such as Santa Cruz and San Francisco. Air travel to/from San Francisco International Airport declined sharply for a couple of months and then returned to normal. One study estimated that short-term hotel occupancy losses may have been $20 million, with an additional $9 million lost in food and beverage revenues (Cochrane, 1990). In 1987, tourism-related spending in the City of San Francisco alone was estimated to be $8 million per day (SF Chronicle, Sept. 1, 1987). Assuming that 1989 tourism-related spending in the 10 county area was about $10 million per day, then tourism-related spending in the region totaled about $3.5 billion per year. Assuming that tourism was heavily affected for a month or two and that some level of decrease persisted for a year or more, total tourism losses may have been in the range of $500 million.

Tax receipts to federal, state, local governments, and special districts decreased because of the earthquake. Business failures, unemployment, decreased sales and tourism-related taxes, reduced assessments due to damaged and destroyed property, and increased tax deductions due to casualty losses all reduced governmental tax receipts. However, because of the difficulty in separating complex economic trends from earthquake-related impacts, accurate estimates of the impact of the earthquake are generally very difficult to obtain. Reassessed property values reduced property tax receipts in the 10 county area by about $4.6 million in 1989; the final tally will undoubtedly be higher. Total business losses from the earthquake reduced San Francisco's tax revenues by about $15 million in 1990, with an additional loss of $3.6 million in property taxes from buildings demolished or declared uninhabitable (SF Chronicle, Jan. 18, 1990). In 1985, San Francisco generated about $50 million in revenues from hotel taxes and about $20 million in sales taxes from tourists. Tax losses to the city for tourism-related activities may have been in the range of $10 million from the Loma Prieta earthquake.

At least short-term postearthquake increases in unemployment were noted in most of the affected counties. In Santa Cruz county, new claims for unemployment in October 1989 were more than four times higher than in October 1988 (Kroll, 1990), although the claims returned to expected levels within two to three months. Despite this, approximately 1400 jobs appear to have been lost in Santa Cruz one year after the earthquake (S.F. Chronicle, Oct. 18, 1990).

Total indirect losses from the Loma Prieta earthquake may be $2 billion or more, not including losses claimed on federal and state income tax forms. These data are not available. The true indirect losses from the Loma Prieta earthquake will never be known precisely. They may well be much higher than this generalized estimate.

Recovery Funding

Funding for recovery after an earthquake comes from a wide variety of sources, including federal, state, and local governments, voluntary organizations, and the individuals and

businesses affected by the earthquake. Despite the large amount of needed federal and state disaster assistance, the shortfall absorbed by Bay Area residents and businesses was estimated by the Federal Reserve Bank to be between $2 to $5 billion (Federal Reserve Bank of San Francisco, 1989). Total federal, state, and charitable disaster recovery funding probably will ultimately total between $3 and $4 billion. Consequently, since the total impact of the Loma Prieta earthquake appears to be more like $10 billion, the affected area probably is absorbing recovery costs totalling $6 to $7 billion, significantly more than the Federal Reserve Bank's early estimate.

FEDERAL PROGRAMS

Only seven days after the Loma Prieta earthquake, the United States Congress responded by appropriating $2.85 billion in disaster funding. Primarily, this appropriation was for the earthquake, although some funds were also earmarked for Hurricane Hugo relief. Of this total, $1.1 billion was allocated to FEMA disaster relief, $1.0 billion was for emergency bridge and highway repair funds for the Federal Highway Administration, $500 million was to replenish the disaster loan fund of the Small Business Administration (SBA), and $250 million in discretionary funds was allocated to enable the President to meet unanticipated needs.

SBA disaster loans to homeowners can cover uninsured losses up to $100,000 for private residences and up to $20,000 in personal property. SBA disaster loans to small businesses can cover economic injury and property loss or damage up to $500,000. Under this program, approximately $567 million in disaster relief has been disbursed as of February 25, 1991, with about $306 million going to homeowners and about $261 million to small business (OES, 1991a). There were 26,715 applications, of which 15,234 were approved, 84 are still pending, and 11,317 were withdrawn or declared ineligible.

FEMA has two primary disaster relief programs for individuals: 1) grants under the Individual and Family Grant (IFG) program, and 2) Temporary Housing Assistance (THA). The IFG program provides grants of up to $10,400 to individuals and families for repairs, replacement of possessions, and other needs. The IFG program disbursed approximately $46 million in Federal funds, with a 25% state matching share. A year after the earthquake, there had been approximately 38,800 applications, of which about 29,800 were approved. About one third (13,160) were withdrawn or declared ineligible. There were 4,200 applications appealed after initially being declared ineligible; about 1,700 of these were subsequently approved (OES, 1991a).

The Temporary Housing Assistance program services both renters and homeowners with grants for emergency housing for up to 18 months or for up to $5000 in repairs to make damaged structures safe for habitation (but not necessarily restored to predisaster condition). The THA program disbursed approximately $25 million in Federal funds, with 25% state matching funds. There were about 38,200 applications, of which almost 14,100 were approved, and about 24,100 were withdrawn or declared ineligible.

Under the Public Assistance Program, FEMA also provides disaster assistance to local governments (including most special districts) and certain nonprofit organizations. As of March 1, 1991, these eligible entities estimated that costs for debris removal, protective services, local roads and bridges, water control facilities, public utilities, and others totaled $483 million. About 60% of these costs ($286 million) were deemed eligible for FEMA assistance, and of this amount the federal share was $217 million (FEMA, 1991). For the public buildings programs, costs estimated by the eligible governmental and nonprofit entities total $317 million, but the approved federally eligible amount totaled only $126 million. There are ongoing negotiations about eligible costs. A majority of the disputes center on the issues of design standards for repair, costs of historical

preservation, and other aspects of reconstruction.

Federal disaster relief also covers damage to some federally eligible highways and bridges through a program administered by the Federal Highway Administration. As of December 28, 1990, $1.47 billion in repairs had been deemed federally eligible (OES, 1990b). This program basically covers the federally supported highway system and includes the interstates and major highways. Final damage estimates are not available for many of these major projects because engineering analyses and design may take several years. Negotiations and disputes about whether to repair or replace, the amount of repair costs, and what design standards should be used may continue for several more years.

STATE PROGRAMS

The State of California has established several disaster relief programs, some of which provide funds required to match funds available under federal programs. As of December 28, 1990, total state funding obligated in response to the Loma Prieta earthquake was approximately $952 million. More than half of this amount was for matching requirements of federal programs, including $234 million in state matching funds for FEMA/DOE (U.S. Department of Education) eligible programs and $280 million in matching funds for highways. Other state programs were appropriated $438 million for services such as Individual and Family Grants ($23 million), housing programs ($134 million), victim compensation ($116 million), tax relief for local governments ($139 million), small business and agriculture programs ($7 million) and miscellaneous State costs ($11 million).

The State Supplemental Grant program augments grants made under FEMA's IFG program when eligible losses exceed the federal limit of $10,400. This program disbursed $4 million; all 654 applications were approved (OES, 1991a).

Through the Department of Housing and Community Development, the California Disaster Assistance Program (CALDAP) provides low interest (3%) loans (with principal and interest deferred until property is sold) to pay for housing rehabilitation costs not paid by other available resources. It is designed as a program of last resort. The CALDAP-O program provides loans for single family homes. CALDAP-R loans are for rental property. As of April 30, 1991, these two programs had contracted for about $61.6 million from total appropriations of $133.3 million.

There also are several other smaller state disaster relief and recovery programs managed by the Department of Housing and Community Development (HCD). The Predevelopment Loan Program-Natural Disaster Component (PLP-ND) provides predevelopment capital for reconstruction or rehabilitation of subsidized rental or homeowner housing damaged by natural disasters. As of June 30, 1990 several projects were under consideration but none had been funded (HCD, 1990).

The Emergency Shelter Program-Natural Disaster Component (ESP-ND) provides emergency shelter for individuals and families made homeless as a result of a natural disaster. As of June 30, 1990 (HCD, 1990) 8 grants totalling $5.3 million had been made.

The Farm Worker Housing Grant Program-Natural Disaster Component (FWHG-ND) rehabilitates homes or rental units that are occupied by agricultural workers and have been damaged by natural disaster. As of June 30, 1990, 3 grants totalling $1.5 million had been made in Monterey and Santa Cruz Counties (HCD, 1990).

The Office of Migrant Services-Natural Disaster Component (OMS-ND) expands operations of state-funded migrant centers when required to temporarily house victims of natural disasters. As of June 30, 1990 about $700 thousand had been encumbered for two contracts in Santa Cruz and San Benito Counties (HCD, 1990).

Funding for the State of California programs came partly from the state reserve fund and

partly from a special 1/4% sales tax for earthquake recovery which was in place between December 1, 1989, and December 31, 1990. The special sales tax raised a total of $763 million as of April 1991, although the final total may be slightly higher due to various reporting periods, late payments, and earned interest on funds to be allocated (Board of Equalization, 1991).

In April 1991 the California Department of Finance issued a status report of funding. This information is synthesized in Table 4-1.

PRIVATE PROGRAMS

Private sector expenditures in response to the Loma Prieta earthquake included various types of insurance, a wide range of efforts by voluntary organizations and, finally, expenditures by individuals and companies affected by the earthquake. As discussed above, total insurance payments were approximately $681 million; this total will undoubtedly go somewhat higher as remaining claims are settled through negotiation or litigation.

A wide range of volunteers responded to the Loma Prieta earthquake. In the hours immediately after the earthquake, volunteers played important roles in search and rescue operations. During the relief and recovery processes, thousands of volunteers and dozens of voluntary organizations provided various kinds of assistance to individuals and organizations affected by the earthquake.

The American Red Cross collected donations from throughout the world and over $78 million were designated by donors for use in relief of Loma Prieta earthquake victims. This large pool of donations is unprecedented and probably results from live television coverage of the San Francisco Bay World Series which had begun just prior to the earthquake.

As of May 1991, the American Red Cross allocated all donor contributions that were designated for this earthquake (about $78 million) on earthquake recovery programs (American Red Cross, 1991). The Emergency and Additional Assistance program helped more than 14,000 families with expenditures of more than $24,000,000. This included traditional Red Cross functions of feeding and housing 69,000 victims in 50 shelters totalling 642,000 meals served, in addition to direct cash grants to persons for replacement of basic personal property and rental assistance. This program also provided services by over 7,000 volunteers and nurses, 40 mobile feeding vehicles and more than 126,000 nights of shelter (American Red Cross, 1991).

The Red Cross Special Disaster Relief Fund has thus far assisted nearly 10,000 people through grants made to local agencies in 61 collaborative projects for transitional and permanent housing, mental health, employment, and legal and human services. With these funds, almost 1,200 housing units are being rehabilitated or newly constructed. The remaining funds continue to support various programs including a Client Advocacy Program (serving more than 2,500 families), disaster planning, and reserves to meet future earthquake-related needs in Northern California as identified.

The Salvation Army had spent $5 million within the first 45 days which helped over 227,000 people, served 100,000 meals and provided groceries, clothing, furniture and medical supplies to very low income persons and families. Like the American Red Cross, the Salvation Army's work with the earthquake victims continues with a particular emphasis on providing transitional housing in Santa Cruz (for older persons) and in Watsonville (for families).

Northern California Grantmakers (1990) compiled a list of 57 foundations and corporations who contributed more than $19 million to Loma Prieta relief operations; major contributors (above $1 million) included the James Irvine Foundation, Pacific Gas and Electric, the San Francisco Foundation, and United Way of the Bay Area. The total charitable contribution (excluding thousands of volunteered hours) after the earthquake was at

least $100 million and perhaps significantly more.

Conclusions

The Loma Prieta earthquake resulted in about $10 billion in direct damage and indirect losses. Publicly funded disaster relief and recovery program expenditures will total $3 to $4 billion, with $6 to $7 billion being absorbed by the individuals and organizations (both private and public) in affected area. Precise and accurate damage and loss figures after an earthquake are generally not available. Most comparative data from preliminary damage assessments are made in the first few days after the event, primarily to gage the disaster's magnitude and help qualify for state and federal disaster declarations or other assistance. These initial estimates are refined relatively little thereafter. No organization is obligated or has a strong interest in continuing to compile generalized, comparable damage estimates, and there is no central organization responsible for compiling and coordinating data about recovery funding. Indirect loss estimates are very crude and subject to very large uncertainties. Public sector recovery funding is fairly well accounted for. Except for insurance information however, private sector loss and recovery funding data for this earthquake are virtually nonexistent. These losses can be derived only by estimating the difference between total estimated damage and losses less public sector recovery funding.

TABLE 4-1
Loma Prieta Funding Status Report: April 1991

ACTIVITY	PROGRESS OR STATUS OF IMPLEMENTATION	TOTAL OBLIGATED/EXPENDED (Dollars in Thousands) State	Federal	Total
EXPENDITURES: Transportation				
Develop revised seismic standards for earthquake resistance to be utilized in the design and construction of new state highways and bridges, and for retrofit of existing highways and bridges. Initial appropriations: $81 million.	Research to develop solutions to multicolumn retrofit and to ultimately update standards is underway. Twenty contracts are in process or near award. Sixteen contracts for single-column retrofit have been awarded and three more projects are advertised. Right-of-way costs are included in construction contracts.	5,129 (research) 5,082 (construction)	0 52,265	5,129 57,347
Emergency public ferry and surface transportation services.	The Federal Emergency Management Agency (FEMA) has denied all ferry system participation. The Department of Transportation (CALTRANS) is appealing the rejection of $3 million in claims previously approved. (*NOTE: The state's funding of this program is from various transportation funds. It is not anticipated at this time that these costs will be reimbursed from the Disaster Relief Fund.)	2,000*	0	2,000
Various street and highway repairs and reconstructions for which the state is responsible (streets and roads for which local governments are responsible are included in the Local Government element of this report). Both the Federal Highway Administration and FEMA participate in funding these repairs.	Caltrans has prepared a comprehensive list of all projects (approved, pending, and denied). Essentially, the smaller projects are completed or underway. The majority of roads and highways damaged in the earthquake are open and operating normally. Some major projects not yet funded and/or completed include the Cypress Street Viaduct replacement, the Embarcadero Viaduct, and the Terminal Separation project.	25,396	288,898	314,294

ACTIVITY	PROGRESS OR STATUS OF IMPLEMENTATION	TOTAL OBLIGATED/EXPENDED (Dollars in Thousands) State	Federal	Total
Board of Inquiry for the I-880 and the Bay Bridge collapse	Eleven days of public hearings were held and the group toured the Bay Bridge, Cypress freeway, and damaged viaducts. The final report was published and resulted in a Gubernatorial Executive Order which established the policy in California regarding seismic safety. In addition, the Executive Order places various requirements on state departments regarding future preparations for earthquakes. The duties of the Board have been completed.	199	14	213
HOUSING				
California Natural Disaster Assistance Program (owner-occupied and rental housing rehabilitation loans). Expenditure authority through June 30, 1991: $96.2 million.	These loan funds are available as a last resort, only after other sources have been exhausted. In most cases, the program is administered by participating local governmental agencies under guidelines developed by the Department of Housing and Community Development (HCD). Where local governments are participating, funding commitments are made only after the local governments have completed their final review and have submitted the application to HCD for final approval. Of the 2,105 applications submitted to date, 649 have been received by HCD and 1,294 are being reviewed by participating local governments. The remaining 162 applications have been denied. It is anticipated that approximately 100-200 additional applications will be received.	56,500	0	56,500
Farmworker Housing Grant Program for rehabilitating farmworker housing. Appropriation: $1.5 million.	Three applications were received and the full appropriation was committed	1,500	0	1,500

ACTIVITY	PROGRESS OR STATUS OF IMPLEMENTATION	TOTAL OBLIGATED/EXPENDED (Dollars in Thousands) State	Federal	Total
Temporary and emergency housing grants within a declared natural disaster area. Appropriation: $9.5 million of which $400,000 reverted as it was not needed.	The following amounts (in millions) have been awarded: $5.0 Emergency Shelter Grant Program .5 Rental Security Deposit Guarantee Program .8 Office of Migrant Services 1.0 Rural Redevelopment Loan Program 1.0 Urban Redevelopment Loan Program .8 Rural Emergency Asst Housing Infrastructure Program	9,100	300	9,400
COMMERCE				
Grant and loan programs for local governments, small businesses and agriculture. Appropriations (in millions): $1.0 grants to cities, counties and small business for recovery 1.0 grants for rural emergency assistance plus authority to transfer funds from the Special Fund for Economic Uncertainties for loans 2.6 grant to Santa Cruz County for 5 projects	The $1 million in grants to cities, counties and small businesses for disaster recovery were given to various entities before February 1, 1990. Local agencies applied for and received $776,000 of the $1 million for rural emergency assistance. As of March 30, 1991, 100 loan applications valued at $7 million were received. Forty-nine were approved for a total of $3.6 million, 18 were denied, and 33 were withdrawn by the applicants. The funds distributed for the approved loans have since been repaid to the Disaster Relief Fund.	7,929	0	7,929
Federal Small Business Administration (SBA) loans to businesses for physical and economic losses.	Of 8,040 applications received, 3,874 have been approved, 39 are pending, and 4,127 have been denied or withdrawn by the applicants.	0	264,238	264,238

ACTIVITY	PROGRESS OR STATUS OF IMPLEMENTATION	TOTAL OBLIGATED/EXPENDED (Dollars in Thousands) State	Federal	Total
STATE FACILITIES				
Repairs and reconstruction of parks and recreation areas.	Work is in process and should be completed in the 1990-91 fiscal year. (*NOTE: These costs are funded by various park bond funds. It is not anticipated at this time that these costs will be reimbursed by the Disaster Relief Fund.)	*333	975	1,308
FEMA participation in various state entities' recoveries.	Seventy-eight applications have been received to date, of which 48 have been approved. Most of the response costs have been addressed, but significant facility restoration/replacement cost issues remain, especially for facilities under the authority of General Services. The largest obligations include (in millions): $7.4 California State University 2.4 Department of Social Services 2.3 University of California 1.9 Housing and Community Develop. 1.2 General Services 1.1 California Highway Patrol 1.0 Department of the Military	17,995	23,364	41,359
LOCAL GOVERNMENT				
Property tax relief	This program reimbursed counties for property tax losses resulting from reappraisal of damaged property. The following counties applied for and received assistance (in thousands): $ 562 Alameda 24 Contra Costa 8 Marin 1,547 San Francisco 827 Santa Clara 1,210 Santa Cruz	4,179	0	4,179

ACTIVITY	PROGRESS OR STATUS OF IMPLEMENTATION	TOTAL OBLIGATED/EXPENDED (Dollars in Thousands) State	Federal	Total
FEMA participation in various local government recoveries, including facilities, city/county roads, emergency response costs, etc. The state will pay the full 25 percent share of the required local match for FEMA funds for this disaster.	One hundred and eighty-seven applications were filed by local government entities. Of this number, 154 were approved for FEMA funding and 155 were granted eligibility under the state NDAA provisions. Many unresolved issues remain as evidenced by more than 70 active appeals. The largest recipients under the federal program are (in millions): $28.5 San Francisco 18.4 Oakland 13.9 Santa Cruz County 9.8 Port of Oakland 4.8 City of Watsonville 4.2 City of Santa Cruz 2.4 Alameda County	55,991	122,624	178,615
PRIVATE NONPROFITS				
Specified private nonprofit organizations eligible for federal and state funds.	FEMA received 330 applications and approved 242. Of these, 126 were also approved under the NDAA program for state funding of the FEMA-required match. Changes in both the federal and state disaster assistance authorities have resulted in private nonprofits becoming the largest single applicant pool. To date, the Watsonville Community Hospital is the only applicant that has exceeded the state cap of $5 million per private nonprofit organization. Also, payment of state funds to all religious organizations has been suspended because of the apparent prohibition of such payments under the state Constitution. The largest state and/or federal obligations to date are for the following organizations (in millions): $39.5 Watsonville Community Hospital 3.9 Redwood Mutual Water Company 2.7 Stanford University 1.7 Mercy High School/San Mateo Youth Center 1.6 Golden Gate University 1.6 St. Francis Youth Center	9,059	58,849	67,908

ACTIVITY	PROGRESS OR STATUS OF IMPLEMENTATION	TOTAL OBLIGATED/EXPENDED (Dollars in Thousands) State	Federal	Total
K-12 SCHOOL DISTRICTS				
United States Department of Education (USDE) participation in assisting districts' recoveries, limited to instructional facilities. FEMA's participation is limited to restoration of noninstructional facilities and is, therefore, much smaller.	Initially, the USDE believed the 1/4 cent sales tax would fully fund recovery costs, thereby disqualifying California for USDE funds. USDE is finally issuing partial payments to some districts; however, only 40 districts have been notified of their eligibility and only 14 districts have actually received awards. Applicants are still being required to submit additional documentation, 18 months after the event. In addition, USDE is restricting awards to cover repairs only to predisaster conditions, without consideration of current codes and standards; and, no supplemental claims for additional work or increased costs directly associated with disaster damage are currently being accepted. This could increase the commitment from the state to fund the necessary work. To date, USDE has only committed a total of $6.6 million. In contrast to USDE, FEMA has accepted claims from 86 districts and approved 62 to date for a total of $3.6 million.	3,589	10,235	13,915
INDIVIDUAL ASSISTANCE				
Victims of damage to Bay Bridge and I 880 Cypress structure.	A total of 409 applications have been received, including 149 for death benefits and 260 for personal injury and/or property damages. Emergency awards totalling $3.6 million and settlements totalling $35.2 million have been paid. Two settlement conferences have been held and the Board has processed approximately 60 percent of the claims submitted.	41,500	0	41,500
Waiver of the waiting period for unemployment benefits.	Program complete: 27,633 claims paid.	0	3,161	3,161

ACTIVITY	PROGRESS OR STATUS OF IMPLEMENTATION	TOTAL OBLIGATED/EXPENDED (Dollars in Thousands) State	Federal	Total
Individual family grant program which provides up to $10,400 (75% federal funding, 25% state funding) for persons with serious needs and/or necessary expenses resulting from a natural disaster. Should a claimant have qualified needs in excess of the basic grant, the state may provide a supplemental grant of up to $10,000.	A total of 38,813 claims were received. Of those, 28,376 have been approved, 9,984 were denied or withdrawn, and 453 were identified as duplicate claims. Total expenditures for grants are expected to be approximately $50.3 million ($15.7 million state). This includes $4.2 million for the State Supplemental Assistance Program. Costs for administration are an additional $7.8 million ($1.7 federal and $6.1 million state). This program is virtually complete. Only the appeals filing period, which closes May 6, 1991, remains open.	21,815	36,268	58,083
FEMA assistance to individuals (temporary housing and shelter)	Of 38,213 applications received, 14,086 have been approved and 24,127 were denied or withdrawn. The high rate of denial appears to be a result of FEMA's very restrictive regulations defining eligibility. The program is complete.	0	29,919	29,919
SBA assistance to individuals (direct mortgage and personal property loans)	This is traditionally the largest single program for individual disaster assistance. Of 18,739 applications received, 11,391 have been approved, 7,299 have been denied or withdrawn, and 49 are pending. The program is virtually complete.	0	306,450	306,450
Personal income tax relief.	It is estimated a total of $114.9 million in tax relief will be granted by allowing an extended period (5 years) for writing off losses.	97,000	0	97,000
Total Expenditures/ Obligations to Date		364,296	1,197,560	1,561,947
*Less expenditures not anticipated for reimbursement from the Disaster Relief Fund		(2,333)	(2,333)	
		361,963	1,197,560	1,559,523
Total Expenditures/ Obligations Subject to Federal and Disaster Relief Fund Reimbursement	Total expended through April 1991 (many obligations remain to be accounted for).			

ACTIVITY	PROGRESS OR STATUS OF IMPLEMENTATION	TOTAL OBLIGATED/EXPENDED (Dollars in Thousands) State	Federal	Total
REVENUES:				
TEMPORARY SALES TAX				
Increase the sales tax by 1/4 cent for 13 months (December 1, 1989, through December 13, 1990) to raise funds specifically for Loma Prieta earthquake recoveries.	Like all California sales taxes in 1990, the amount collected for the Disaster Relief Fund was less than originally anticipated. Actual receipts are $21.9 million less than the original estimate of $785 million.	**763,100**		

Source: California Department of Finance, April 1991

Chapter 5

Legal Issues

The State of California and some of the local governments hardest hit by the Loma Prieta earthquake have been the subject of tort claims alleging wrongdoing by their officials before and after the Loma Prieta earthquake. Private-sector owners and tenants of properties, as well as third parties, have been parties to litigation involving personal injuries, property damage, and 63 fatalities related to the trembler. This section on the legal issues of the Loma Prieta earthquake provides an overview of the allegations, the legal theories, and the defenses identified in litigation related to the October 1989 earthquake. It is not intended to be an exhaustive study of liability issues attending natural disasters or earthquakes, but, rather, serves to illustrate the types of cases, the peculiarities of earthquake damages, arguments proffered, and dispositions to date.

Public-Sector Issues

STATE GOVERNMENT: I-880 CYPRESS STREET VIADUCT & THE OAKLAND-SAN FRANCISCO BAY BRIDGE

A total of 42 people were killed and 108 injured when the Interstate 880 Cypress Street viaduct and a segment of the Oakland–San Francisco Bay Bridge collapsed during the Loma Prieta earthquake.

In November of 1989, the Legislature met in special session and determined that to aid the victims of the collapse of these two structures it was necessary to create a special fund for the payment of personal property, personal injury, and death claims arising from the disaster. Although the liability of both state and local governments is generally controlled by the provisions of the *California Tort Claims Act*,[7] in that special session the Legislature also enacted Section 997 *et seq.* of the Government Code to compensate victims of the two collapse disasters without regard to liability, fault, or responsibility, and without the necessity of litigation against the State of California or its officers or employees.

This hybrid "no fault" procedure has so far proven to be quite successful in processing claims and compensating victims of the two collapses. However, some claimants' attorneys believe there were certain shortcomings,[8] such as the absence of direct, supervisory power by the judiciary in the appointment of the "settlement master." They contend that if the duties of the settlement master had been more precisely defined, or had he been given the power to act as an arbitrator and issue binding decisions upon both parties, some cases would have settled even sooner. Further, they allege that the six month deadline for the resolution of claims, originally intended to require speedy settlement of claims, has been used to force some clients to either accept inadequate compensation or to commence traditional tort litigation against the State. At least 14 claimants have decided to reject the State's settlement offers under this extraordinary legislation and are pursuing traditional tort litigation, and the number of those choosing to litigate their claims is expected to grow.

The overall success of this novel "no fault" approach to the Loma Prieta earthquake may set

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[7] See Section 810 *et seq.* and 900 *et seq.* of the Government Code.

[8] Correspondence from the California Trial Lawyers Association commenting on an early draft of this report.

a precedent for future damaging seismic occurrences. However, any final evaluation will have to await the termination of the Section 997 no fault process and the results of subsequent tort litigation, if any, related to these structure collapses.

LOCAL GOVERNMENT

Some of the cities hardest hit by the Loma Prieta earthquake have also been the subject of claims alleging wrongdoing by officials before and after the event. The major examples of the typical allegations, legal theories and defenses raised as a result of the October 1989 earthquake follow.[9]

Inverse Condemnation. A relatively small number of building owners[10] have alleged that their buildings were demolished by local government without good cause, or without notice or opportunity for hearing, in violation of Article I, Section 19 of the California Constitution and/or the Fifth and Fourteenth Amendments to the United States Constitution. A second category of owners alleged the same theory, claiming that only part of their buildings needed to be destroyed and thus total destruction constituted an unconstitutional taking.

Some of the inverse condemnation-related issues that have arisen in the aftermath of the Loma Prieta earthquake are:

- *Inverse Condemnation Claims by Tenants*—Claims for loss of personal property were filed by tenants in retail and office buildings demolished after the Loma Prieta earthquake.
- *Conversion of Personal Property*—Some tenants claimed it was an unlawful "conversion"[11] to dispose of their personal property without providing them an opportunity to salvage personal property after building demolition.
- *Negligent Demolition*—There were three categories of claims regarding negligent demolition arising from the Loma Prieta earthquake:
  1. Owners claiming that only partial demolition was needed;
  2. Adjacent property owners claiming that their buildings could have been saved but for the fact that the adjoining building, often with a common wall, was removed thereby weakening the "undamaged" building; and,
  3. Some owners claiming that their undamaged adjacent buildings were damaged by negligent removal of debris such as dropping debris through the roof of the building, or damaging walls or foundations with heavy equipment while demolishing adjacent buildings.
- *Interference with Economic Advantage or Contract*—Business proprietors have claimed interference with economic advantage and interference with the lease contract between the tenant and property owner.
- *Conspiracy*—Tenants and property owners have alleged cities, city officials and/or elected officials conspired with state or federal agencies to obtain federal money by demolishing the property owners' buildings.[12]

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9 For a broader treatment of this topic, see J. Robert Flandrick, *Governmental Powers, Liabilities and Immunities During Emergencies: Exercising Legal Powers After an Earthquake*, submitted to the League of California Cities, Earthquake Recovery Workshop, November 9, 1989.

10 As an example, the City of Hollister had four inverse condemnation claims, all of which have been settled without resort to trial.

11 The term "conversion" is defined as an unauthorized assumption and exercise of the right of ownership over goods or personal property belonging to another, to the alteration of their condition, or the exclusion of the owners rights; the unauthorized and wrongful exercise of dominion and control over another's personal property, to the exclusion of, or inconsistent with, the rights of the owner.

12 In such a claim, the plaintiff must show that there was an 'unlawful agreement". Actions taken by cities after the declaration of a disaster by the Governor are controlled by the California Emergency Services Act, Government Code Section 8550, et seq.. If decisions to demolish buildings were based upon the exercise or performance of discretionary functions of city employees in carrying out the Emergency Services Act, the Employee and city are immune from liability. (See Government Code Section 8655 and California Civil

- *Emotional Distress*—Some of the claimants also alleged emotional distress in conjunction with property damage claims. Unless the plaintiffs can prove that there was some preexisting special relationship or intentional tort, such actions for emotional distress are barred.[13]

Because relatively few inverse condemnation claims were made in the aftermath of the Loma Prieta earthquake and they appear to be settling without resort to trial, as well as the protracted length of time it will take to try and subsequently appeal any claims actually litigated, definitive conclusions or insights are not available at this point. There is, however, one previous related claim from the 1983 Coalinga earthquake that may prove controlling on Loma Prieta earthquake-related inverse condemnation claim.

The only "reported" California case, i.e., a published appellate decision, involving the summary demolition of an earthquake-damaged building resulted in a decision holding that a claim for inverse condemnation would stand if the city failed to prove, after trial, the existence of an emergency.[14] (*Rose v. City of Coalinga* (1987) 190 Cal.App.3d 1627). In reversing the trial court's summary judgement for the city, the Court of Appeal found that at least two triable issues of fact existed. First, was there a true emergency? The conclusions of a contractor, an architect, and the State Office of Emergency Services, as well as the fact that the City waited 57 days to demolish the building, raised at least an inference that the building was not a hazard. Second, factual questions were raised as to whether the Roses voluntarily consented to the destruction of the building by signing the release or whether it was signed under the influence of duress and misrepresentation.

The appellate court decision in the *Rose* case teaches:

1. In an emergency situation involving the physical safety of its citizens, a city can dispense with a due process hearing and demolish a building summarily. If the demolition is challenged, the city bears the burden to establish by a preponderance of the evidence the necessity for immediate destruction.
2. If any doubt exists as to whether the building is repairable, an administrative hearing should be held at which the property owner is given the opportunity to present evidence and crossexamine the City's experts.
3. If, after the administrative hearing, doubt remains as to the building's structural integrity, the city should obtain a judicial determination prior to demolition.

Two other potential pitfalls with respect to building demolition deserve mention. First, if the determination is made that a due process hearing is required, the city should be certain that it contacts the owners and others having an interest in the property ("owners") prior to demolition. If there is any appreciable gap between the time notice is given and the demolition, the city has a duty, beyond merely checking the last equalized assessment role, to determine the identity of the owners. If the owners cannot be ascertained, then the city should record a *lis pendens*,[15] and post the

Code Section 1714.6). In addition, the standard Government Code immunity provisions apply. (See Government Code Sections 815, 815.2 and 820.2). If the agreement was authorized by law (such as the Emergency Services Act, the police power or summary abatement provisions) it is lawful per se; there can be no conspiracy to do a lawful act. Hence, conspiracy has not proven to be a legitimate issue in the aftermath of the October 1989 earthquake.

13 *Cooper v. Superior Court* (1984) 153 Cal. App. 3d 1008, 1012.

14 The June 10, 1991, decision by the 6th District Court of Appeal in *Mound Lodge No. 166 IOOF v. City of Hollister* (No. H007623) has been decertified for publication by the California Supreme Court. It is noteworthy that in this Court of Appeal decision, however, the Court followed the *Rose* rationale, holding that "[I]f there is to be any check on governmental power in an emergency, one whose property is taken must have a due process right to a factual hearing. ...If City (sic) produced affidavits showing the necessity of destroying the Odd Fellows Hall on the day after the earthquake, a universally recognized emergency situation, it is likely that the City (sic) could demonstrate the legitimacy of its emergency response [demolition of the Odd Fellows Hall]. Assuming a *proper* exercise of the police power, City (sic) would be absolutely immune under the Emergency Services Act. (Emphasis in original)."

15 A notice filed on public records for the purpose of warning all persons that the title to certain property is

property giving constructive notice of the pendency of proceedings. (See *Friedman v. City of Los Angeles* (1975) 52 Cal.App.3d 317).

Second, if a building has been designated by a city or the State as an historic structure, the *California Environmental Quality Act* (CEQA) must be considered. Although, CEQA contains an "emergency" exemption (Pub. Res. Code, Sect. 21172; Cal.Admin. Code, Sect. 15269, 15359), if no true emergency exists, and if city officials are given "permit discretion" under the city's code, the demolition is a "project" and an environmental review may have to be conducted prior to demolition.[16] (See discussion regarding Santa Cruz's CEQA-related litigation over demolition of the St. George Hotel below).

CEQA-based Litigation/the St. George Hotel Case. A coalition of preservation groups including a local group, Friends of the St. George, the California Preservation Foundation, and the National Trust for Historic Preservation, filed a lawsuit to prevent the demolition after the Santa Cruz City Council on July 24, 1990, voted 6-1 to allow the owner to demolish the St. George. Preservation interests decided to litigate the demolition because of the statewide importance the applications of both SB3x (a Senate Bill enacted in the special legislative session convened after the Loma Prieta earthquake that protects damaged historic buildings) and the California Environmental Quality Act (CEQA) may have to halting "pretext" demolitions of damaged historic buildings.

In ruling that the City had acted lawfully in approving the demolition, the trial court found that the CEQA exemption for projects where the Governor declares a "state of emergency" following a natural disaster, does not require that the specific demolition project qualify under CEQA definition of "emergency." Furthermore, the trial court upheld the City's assertion that, for the purposes of SB3x, evidence in the record supported the City's finding that the St. George posed an imminent threat, rejecting the contention the mere passage of time establishes that an imminent threat did not exist. The City's demolition decision was based on engineers' determinations that the building presented an imminent threat to public safety.

In an unpublished opinion reviewing the trial court's determination, the Court of Appeal unanimously found little probability that opponents would prevail on the merits of their argument:

> "First the trial court has found clear and convincing evidence that the building presents an imminent threat to the public health and safety. The evidence of record appears to support that finding. Therefore City would not be required to follow the procedures of Public Resources Code Section 5028, as the trial court found."

Though the demolition opponents also argued that CEQA required predemolition environmental review, the Court of Appeal found that "...the project appears exempt from CEQA under the state of emergency exemption, Public Resources Code Section 21080 (b) (3)."

The appellate court affirmed the trial court finding that the state of emergency exemption was clear and unambiguous and that substantial evidence supported its application, and no further review was necessary.

Demolition of the St. George Hotel Was Exempt from State Review—Section 5028 of the Public Resources Code requires predemolition approval by the State unless the structure presents an imminent threat of danger to the public or to adjacent structures.[17]

The City of Santa Cruz evaluated the structure according to Office of Emergency

in litigation, and that they are in danger of being bound by an adverse judgement.

[16] Senate Bill 744 (Marks), introduced on March 6, 1991, would amend Section 5028 of the Public Resources Code to prohibit an inventoried "historic place" from being demolished, destroyed, or significantly altered unless a local agency provides written findings that the historical place poses a "clear and imminent threat of bodily harm to the public or substantial damage to adjacent property and there is no feasible and prudent way to isolate the threat."

[17] See note a, p. 5-5, supra.

Services criteria[18] and concluded that it presented an imminent threat. Nothing could be done to lessen the threat to adjacent structures other than surrounding the St. George with fences in the middle of adjacent streets to prevent falling objects from harming the public. The city successfully further contended that if the St. George's owner elected demolition to abate the nuisance and the State would not allow it, the municipality could be left powerless to abate the nuisance; a structure that presented an imminent threat of harm, according to established statewide (OES) criteria, could not be removed.

Protracted CEQA-based Litigation Would Have Caused Disproportionate Injury to the City of Santa Cruz—Relying on *Mills v. County of Trinity* (1979) 98 Cal.App.3d 859, 861, the City of Santa Cruz successfully contended that a stay in the demolition of the St. George Hotel, while the case was further appealed by demolition opponents, would cause disproportionate injury to the party which prevailed at trial, and no stay should issue. The Court of Appeal, acting in its equitable capacity, weighed the benefits of delaying demolition against the burdens of a stay as follows:

The Benefits from Staying Demolition of the St. George Were Minimal—The sole claim of benefit from staying demolition was the historic value of the St. George. The St. George was listed in the City's Historic Building Survey and had been named as a contributing building in an historic district. The district had been listed on the National Register of Historic Places, and other buildings in the district have been individually listed. *The St. George was not individually listed.*

The Burdens of Delay in Demolition Were Extraordinary, Braking Momentum for Rebuilding and Interfering with Economic Viability of Surviving Businesses—The City's downtown was devastated by the earthquake; buildings which survived were neighbors to gaping holes, and there still is no structural continuity in the business district. In successfully preventing any further delay in demolition, the City of Santa Cruz made the following arguments:

- Delay made survival of existing businesses more difficult;
- Delay was harmful to the adjacent property owner and tenant;
- Postponement of demolition delayed rebuilding on sites where buildings were destroyed;
- Delay in demolition jeopardized new investment in Santa Cruz;
- Delay in demolition delayed return of affordable housing;
- Delay resulted in the loss of revenues to the City of Santa Cruz; and,
- A stay in demolition would have caused burdens on the City which outweighed the benefit of preservation of the damaged St. George.

Though the *St. George* case resulted in an unpublished appellate opinion that does not constitute binding, legal precedent, it does provide a litigation model for future earthquake-related proceedings concerning the demolition of historic buildings.

Traditional Tort Liability. Claims against local governments resulting from the Loma Prieta earthquake appear to fall into two categories. The first relates to building demolitions after the earthquake (discussed *supra*). The second relates to allegations of negligence by city or county officials before the earthquake, which plaintiffs claim caused damage or injury that would not have occurred but for the official action or omission. Some of the issues in the second category include:

- *Failure to Inspect or Negligent Inspection*—Claimants have alleged that local governments should have inspected and identified dangerous buildings prior to the Loma Prieta earthquake, and that such failure to inspect was the proximate cause of property damage, personal injury or, tragically, wrongful death.

[18] The State Office of Emergency Services (OES) has defined criteria for evaluating earthquake damaged structures. Structural conditions are listed which indicate an "Imminent danger of collapse from an aftershock." The City evaluated reports from six different sets of engineers all of whom recorded observations indicating an imminent threat by OES criteria.

- *Dangerous Condition of Public Property and Failure to Warn*—"Dangerous condition" claims relate to personal injuries resulting from collapse or failure to publicly owned structures. Some claimants have attempted to fashion a theory by which liability could be found if the trier of fact establishes that building inspectors, etc., knew the building was hazardous and failed to warn adjacent property owners of the danger.

In many instances however, these claims are subject to the general provisions of governmental immunity contained the *California Tort Claims Act*, although such immunities are not absolute. Despite the fact that cities generally are not liable for failure to inspect for building violations or hazards to safety (Government Code Section 818.6), recent court decisions have expanded the ability of plaintiffs to collect damages when a known risk causes a foreseeable injury or damages.

However, the individual employee immunities do not extend to alleged misrepresentations amounting to "actual fraud, corruption or actual malice." (Government Code § 822.2) In the case of Cooper v. Jevne, (1976) 56 Cal.App.3d 860, the Court held that a cause of action can be stated against a building inspector for faulty construction of a building subsequently damaged in an earthquake where it is alleged that the inspector did not make the proper inspections because of fraud, corruption and malice. Under law, if a governmental employee is guilty of actual fraud, corruption or actual malice, the employee can also be liable for punitive damages in addition to compensatory damages, and the public agency has no obligation to defend the employee or to pay any such judgment rendered against the employee. (Government Code §§ 818, 825 et seq. and 995 et seq.).

At least one case has been filed in Santa Cruz County seeking damages from building inspections for a home destroyed by the Loma Prieta earthquake, based on the allegations that the structure was defectively constructed, and that two former County building inspectors fraudulently did not perform proper inspections when the house was constructed some nine years earlier.[19] The County is currently providing a defense for the former County building inspectors, but is reserving the right not to pay any judgment, since the County has full immunity regarding inspections. The former inspectors will also be entitled to immunity unless they are found guilty of actual fraud, corruption or actual malice, and in such an event, the County would have no legal obligation for such a judgment. Although allegations of fraud, corruption and malice are relatively simple to include in a complaint, they present difficult proof problems, particular when the alleged acts or nonactions took place many years previously. Plaintiffs assert the right to litigate their claims at this late date based on the general rule that the statute of limitations does not commence to run on a cause of action for fraud until the fraud was reasonably discoverable, and based on their statement that they did not know of the defective construction until the earthquake destroyed their house.

As previously noted, out-of-court settlements, and the protracted length of time it will take to try and subsequently appeal any claims actually litigated, preclude any definitive conclusions or insights at this point in time.

Planning/Postquake Recovery in the Santa Cruz Mountains. Much of Santa Cruz County—the Loma Prieta earthquake's epicenter site—consists of hilly or mountainous areas with substantial residential development. Almost immediately after the earthquake, the county faced critical decisions about rebuilding in mountain areas where the geologic after-effects (e.g., landslides) were largely unknown. At first the county's approach was extremely cautious; an emergency ordinance was adopted less than a week after the quake which made all earthquake damage repairs subject to review under the county's geologic hazards ordinance. For some properties, this resulted in requirements for preparation of geotechnical or

19 *Olson v. Messier*, Santa Cruz Superior Court no. 113121.

geological reports before permit applications could be considered.

The public reaction to the geologic review requirement was almost immediate and uniformly negative. For most people, concerns about geologic hazards ended with the shaking; concerns about future hazards from landsliding and other types of failure were too remote and speculative compared to their immediate recovery needs. To be fair, geologists could not provide a clear and precise assessment of potential hazards in many areas, nor were they able to provide assurance of safety. This uncertainty greatly diminished the political palatability of a geologically cautious approach to rebuilding. As of the Spring of 1991, only one inverse condemnation-type suit has been filed over the rebuilding/permit issue,[20] but there have been reports of noncompliance and rebuilding without geotechnical review or the required permits. In addition, one class action suit has been filed seeking damages for an alleged interference with property rights resulting from a County ordinance requirement of a recorded Declaration of Geologic Hazard which includes: (a) a disclosure of the pendency of an areawide geologic study of a potential landslide hazard resulting from the Loma Prieta earthquake; (b) a waiver of any claims related to the issuance of a damage repair permit; and (c) an agreement to hold the County harmless from any third party claims relating to the issuance of the repair permit. The suit has not (to date) been served on the County of Santa Cruz.

Class Action Litigation for Low Income Renters *(Smith v. FEMA)*. Several thousand low cost rental units were severely damaged and destroyed in the Loma Prieta earthquake. Among these were 2,070[21] single room occupancy (SRO) or equivalent low income units that were made uninhabitable by the earthquake. These units were located in Alameda and Santa Cruz Counties and the City and County of San Francisco. Of these 2,070 units, 388 were in San Francisco, 1,117 units were in Alameda and 565 units were in Santa Cruz. The denial of assistance to persons residing in this lost low-income housing resulted in the *Smith v. Federal Emergency Management Agency (FEMA)* class-action litigation that was instituted against FEMA by the Legal Aid Society of Alameda County.

The plaintiffs in *Smith v. FEMA* were members of a class of low-income persons who prior to the earthquake were living in single room occupancy apartment units and who, following the earthquake, applied to FEMA for but were denied temporary housing assistance benefits under Section 408 of the federal Disaster Relief Act (42 U.S.C. Sect. 5174). Plaintiffs were denied these benefits on the grounds that either they had not resided continuously in the same rental unit for at least thirty days prior to the earthquake, and thus were deemed to be ineligible for benefits under FEMA's 30-day continuous residency requirement ("the 30-day rule"), or they shared a rental unit with one or more other unrelated individuals prior to the earthquake, and were denied benefits under FEMA's requirement that only one check be issued per household (the "shared housing rule"). Other plaintiffs in this litigation were members of a class of persons who were not given notice of their right to appeal the denial of their applications for benefits or were otherwise adversely affected by alleged inadequate procedures on FEMA's part in respect to the appeal process.

As a result of a settlement of the *Smith v FEMA* suit, FEMA has agreed to provide three types of benefits:

- It will make funding available for replacement of single-room occupancy or other equivalent low-income housing units which contain a private sleeping room in each unit (SROs) and shelter units which were rendered uninhabitable by the

[20] *Olson v. Messier*, Santa Cruz Superior Court No. 113121.

[21] Of these 2,070 units 114 units in Alameda County have already been approved by FEMA for funding through other means and therefore are not further eligible for the benefits described herein. Since the 114 units are not eligible for funding under this agreement, that number of units and the corresponding number of dollars for each unit are not included in the settlement.

earthquake, to the extent such funding is requested by local governments or owners or operators of private nonprofit facilities;

- It will make funding available for reimbursement to local governments for special housing vouchers, to provide interim temporary housing for individuals who were denied temporary housing assistance benefits under the 30 day rule; and,
- It will provide housing assistance benefits for individuals whose claims were initially denied under the "shared housing" rule. In addition, FEMA has agreed to give notice of appeal rights to individuals who did not receive such notice initially and to promulgate guidelines for appeals.

The total maximum amount of monetary benefits authorized pursuant to the settlement agreement for replacement of housing is $23,040,000.[22] The individual breakdown of allocations per county is:

County	Total	FEMA 75% Share
S. Francisco	$ 5,535,000	$4,151,250
Santa Cruz	5,925,000	4,443,750
Alameda	11,580,000	8,685,000

Although this case resulted in a settlement which does not constitute binding, legal precedent, it does provide a litigation model for future earthquake-related suits challenging how FEMA may employ eligibility criteria in future seismic disasters. Given the high probability of a major earthquake occurring in an urbanized area of California within the next 30 years, the combination of yet another loss of a large number of low cost housing units and the limited fiscal resources to replace them may make *Smith v. FEMA* the prototype for further litigation to compel the federal government to address the issue of low cost housing in any recovery effort.[23]

[22] FEMA is responsible for funding only 75% of county expenditures, up to the maximum of 75% of $23,040,000, unless an additional percentage is waived.

Private-Sector Issues

Private-sector litigation arising from the Loma Prieta earthquake appears to be centered on traditional disputes between insurance companies and their policy holders, and personal injury/wrongful death issues.

INSURANCE ISSUES

Some 30 lawsuits were filed in Santa Cruz County in the aftermath of the Loma Prieta earthquake, alleging that major underwriters did not give the victims all the help they were due, a charge that one major carrier denied, noting that of more than 27,000 claims totalling $120 million, it had received only 28 complaints. It is also alleged that claims adjusters lacked experience or training, and that damage claims were improperly closed with no or insufficient payment to victims.

A major source of compensation for those injured or killed in the Loma Prieta earthquake was workers' compensation. The concept of workers' compensation is based on liability without fault, and although there are specific limitations upon workers' compensation

[23] A year and a half after the Loma Prieta earthquake, many low income Bay Area residents are still living in homes with leaking roofs and unstable foundations. Many homes have serious structural damage caused by the earthquake that has still not been repaired. Concerned community groups and low income homeowners directly affected by the unfair practices filed an administrative petition in June of 1991 alleging that the agencies responsible for compensating homeowners for needed repairs, the Federal Emergency Management Agency (FEMA) and the Department of Social Services' Individual and Family Grant Program (IFGP), have denied low income homeowners their fair share of relief. Petitioners are demanding that an oversight committee review cases to identify those people who were not adequately compensated; that FEMA/IFGP make additional funds available to those people; and that policies be changed so that the victims of future disasters are not also subjected to reputedly discriminatory practices. Inasmuch as the petitioners' administrative remedies have not been exhausted as of this date, a suit has not been filed.

payments,[24] "acts of God" are not among them. A more complex workers' compensation-related issue involves the Cypress structure and whether employees were commuting from their jobs. While courts have developed "the going-and-coming rule" that excludes workers' compensation coverage of regular commuters, litigation may yet arise over whether there was a business purpose to some victims' trips. More research of this issue will be necessary, as will its relation to the Legislature's "no fault" claim procedures that were instituted to compensated victims of the Cypress Street viaduct and the Oakland–San Francisco Bay Bridge collapses. As of this date, the California Department of Insurance reports that 419 Loma Prieta-related claims have resulted in payments of $2,496,000.

The Loma Prieta earthquake also brought to light another earthquake-related coverage problem. In an unpublished decision denying review of an appellate court decision, the California Supreme Court rejected a Mill Valley homeowner's claim that insurance should cover newly required "code upgrades."[25] Although this denial of review does not set a legal precedent, it nonetheless has the effect of requiring the purchase of specific riders because damage payments only cover "equivalent replacement," not restoration in-kind of code updates or restoration of the "historic fabric" of a building.

SAN FRANCISCO'S "WAREHOUSE" SUIT

The litigation arising from the five deaths caused by the alleged earthquake-related partial collapse of an unreinforced masonry building, known as the Warehouse, located at 175 Bluxome Street in San Francisco, provides the definitive example of the private sector tort claims arising from the Loma Prieta earthquake.

The case against the partnership owning the Warehouse was premised upon three theories of liability, termed "causes of action": traditional negligence resulting in wrongful death; strict liability; and, maintenance of a public nuisance.

Although not a cause of action, punitive (exemplary) damages were requested by the plaintiffs. The basis for the requested imposition of punitive damages was an allegation that the owners knew that the building had partially collapsed previously due to inherent structural problems and that it would not survive a moderate earthquake. It was claimed that the owners were advised that the structural deficiencies created a risk that the building might partially or totally collapse at any time and would be subject to collapse during a moderate earthquake. These allegations were supported by copies of engineering reports prepared for the defendant partnership. Despite this alleged specific knowledge, it was claimed that the defendant partnership deliberately failed to take any actions to correct the claimed structural deficiencies or warn others of the allegedly dangerous and defective condition of the building. The plaintiffs contended that the foregoing alleged actions and omissions constituted a conscious disregard for the public safety amounting to reckless conduct resulting in the fatalities giving rise to the suit.

Available court documents indicate that the defendant partnership's primary defense was apparently based upon a claim that the fatalities were the result of an "obvious act of God," and, further, that punitive damages are unconstitutional.

Unfortunately, from the academic perspective of learning from earthquake litigation, this suit was settled by the parties, and the issues were not resolved at trial and scrutinized by an appellate court. Consequently, no definitive case law will result from this litigation. Hence, the "act of God" defense still may be legitimately plead. The legal applicability of strict liability and the imposition of punitive damage to those who maintain a building known to be unsafe in an earthquake also remain unresolved. Compounding this lack of resolution is the fact that the settlements in this case contained a

[24] See Section 3600 *et seq.* of the Labor Code.

[25] See *McCorkle v. State Farm Insurance*, Aug. 15, 1990.

provision imposing secrecy about the case.[26] However, a recent announcement indicated that the owner will pay $4.9 million to the families of three of the five people crushed to death and to an injured worker. The settlements were disclosed after confidentiality agreements expired October 1. Lawyers for the victims said it was just one of the first of significant payments from the building owner on claims that injuries were caused by earthquake safety defects.

It should also be noted that the U.S. Supreme Court has expressly rejected the argument that punitive damages are unconstitutional, and claims for punitive damages may still be legitimately pleaded in earthquake-related litigation. (See *Browning-Ferris Ind. v. Kelco Disposal, Inc.*, (1989) 109 S.Ct. 2909). Hence the next damaging earthquake will probably see these issues revisited, and perhaps resolved.

Conclusions

The legal aftershocks from an earthquake will continue long after the seismic aftershocks. Already, however, one may distill the following conclusions from the discussion above.

Damaging earthquakes strike California on a regular basis; earthquakes with a magnitude of 6 or greater on the Richter scale have struck 102 times in the 140 years since California became a state. Every populated urban area in California has been struck with damaging forces and will be again. Seismologists currently believe there is a 67 percent chance of a major earthquake striking the San Francisco Bay area, and a 50 percent chance of a similar magnitude earthquake occurring in southern California within the next 30 years. This makes the occurrence of a great earthquake not a question of "if" but rather of "when." Advances in seismology and engineering allow governmental leaders and planners to recognize where quakes may occur, to anticipate approximately when they will occur, and to make reasonable estimates of their expected intensity. Also, the phenomena that cause ground failure are known as well as the types of structural design and construction that are prone to failure. Both the private-sector and the public-sector have been able to predict with reasonable certainty what the economic impact of a great quake will be for specific areas of the state. Inasmuch as California earthquakes are demonstrably foreseeable and far from being unexpected or extraordinary occurrences, neither an earthquake nor the damages occasioned by an earthquake may be termed "an act of God."

Settlements of private-sector suits, negating trial and appellate court review, will leave many legal issues unresolved in the area of traditional tort liability, as will the "no fault" procedures implemented by Government Code Section 997 with regard to the Cypress structure and Bay Bridge collapses. The lack of legal precedent will be further exacerbated unless the appellate courts are more willing to certify earthquake-related cases for publication as reported cases, e.g., the St. George Hotel decision.

One of the major lessons is that it is extremely difficult to make well-considered decisions on technical issues such as geologic safety in the emotionally charged atmosphere following a major disaster. While the normal development review process is focused on long term safety, the earthquake repair process is unavoidably focused on expedited recovery. Jurisdictions wanting to address geologic safety following a major earthquake—beyond minimum seismic standards—can expect strong pressure to relax those standards and expedite recovery. The lawsuit[27] against Santa Cruz County, and enforcement litigation, if any, relating to planning and the permit process, arising out of the Loma Prieta earthquake should be closely monitored. Their outcome could seriously affect government's ability to

[26] Senate Bill 711 (Lockyer), introduced on March 6, 1991, would bar such secrecy in settlements by providing that, as a matter of public policy, in civil actions based on personal injury or wrongful death no confidentiality agreement, settlement agreement, stipulated agreement or protective order which bars public disclosure of such an agreement shall be valid.

[27] Olson v. Messier, supra, note 12, and the unserved class action suit noted at page 14.

assist in the recovery of economic stability in devastated cities after an earthquake.

The litigation related to the Loma Prieta earthquake also reaffirms that State and local governments will not be allowed to compromise the closely related constitutional principles of due process or the prohibition against taking of property without compensation when mitigating hazards to public safety on private property. As demonstrated by the *St. George Hotel* case, litigation and appellate procedures may interfere with, and delay recovery, as well as seismic hazard mitigation. Guidelines that allow policy makers to exercise their best judgement and implement critical seismic safety actions required to improve the safety of the public, in conjunction with the safeguards provided by peer review, the political process, and judicial review of their decisions, are essential.

Chapter 6

Recommendations from Affected Communities

Introduction

Early in its investigation of the lessons of the Loma Prieta earthquake, the Seismic Safety Commission held eight hearings in several jurisdictions most affected by the quake. While there was similarity in the testimony, the most striking impression is that the issues and experiences emphasized in some locales were quite different from those in others. Watsonville's Loma Prieta earthquake experience was different from Oakland's. It is not surprising that earthquakes affect individual communities differently, based on many geological, social and economic factors. In an effort to capture these differences and acknowledge the experiences of the variety of communities affected by the earthquake, the Commission contracted with six jurisdictions to write their own suggestions and recommendations for changes in policy and programs that would assist the state and other communities in future earthquakes. The six jurisdictions submitting individual reports for inclusion here are: Los Gatos, Oakland, San Francisco, Santa Cruz, County of Santa Cruz, and Watsonville.

The Commission's overall direction was that the jurisdictions should consider four general seismic safety/earthquake disaster topics (hazard reduction, emergency period, short-term recovery, and recovery-reconstruction). Based on their experiences with the earthquake and its aftermath, they should select and describe the key issues and identify the problems they felt could be most alleviated by changes in policy, programs or plans—with emphasis on what the State could do. Lastly, their reports should be brief (5-10 pages), and should emphasize their recommended policy improvements rather than describe events.

The resulting reports provide an array of experience, ideas, and suggestions for improvement in policies and programs dealing with the earthquake hazard.

Synthesis of Community Recommendations

In formulating its recommendations based on the Loma Prieta earthquake investigation, the Commission carefully reviewed the range of actions suggested in the following reports by affected communities. The suggestions include ways to reduce the level of destruction in future earthquakes, to deal with immediate postearthquake public service demands, and to improve the effectiveness of programs assisting community recovery and reconstruction processes. This section compiles major recommendations emphasizing suggestions for the State of California.

EARTHQUAKE HAZARD MITIGATION

The communities recommended that the State continue or institute programs or requirements for future damage reduction through the following types of activities:

- Public education about earthquakes, causes of damage and injuries and protective actions the public can take to reduce hazards

- Development of earthquake-resistant construction techniques and codes and standards for upgrading existing buildings
- Extension of seismic retrofitting requirements to all structures built before seismic safety codes were enacted
- Identification of areas of high earthquake risk
- Development of policies to mitigate potential damage to facilities located in high risk areas

Specifically, the three communities whose homeowners sustained much of the damage to older single family homes urged the State to require appropriate retrofitting of such dwellings. The community in which mobile homes were most severely damaged recommended that the State require appropriate mobile home bracing. These actions would not only reduce damage and repair costs, but would also reduce the potential for fires. When these single family homes and mobile homes shift during an earthquake, they often sever utility gas lines, and gas leaks are major sources of postearthquake fires.

IMMEDIATE AND SHORT-TERM RESPONSE NEEDS

The State's immediate response to an earthquake should be planned. The State OES Fire and Rescue coordinator should be given the power to send resources to areas impacted by an earthquake automatically, without delay. It is already known that there *will* be immediate demand for fire engines, water tenders, portable water mains, rescue equipment, and many emergency response personnel. Officials will be too caught up in survival response to be able to make and give the State immediate assessments of the overall picture, or make precise requests for equipment and personnel.

Several communities endorsed the Incident Command System and stated that the State should require that local emergency response plans adopt that system for emergency management. Not only was it reported to be locally effective, but also its use provides consistency among local plans. This in turn enhances the effectiveness of mutual aid programs and agreements. The State should also require a minimum number of routine exercises, with State participation and review. In several cases, communities reported that recent practice with their plans, and the August 1989 State/federal Response '89 exercise made a very positive contribution to effective and timely response immediately after the earthquake.

One community suggested that certain "qualified" cities be exempt from the current OES requirement to participate in the Management Operational Area organizational scheme. This often requires six levels of bureaucratic approval for cities' requests for resource authorization (obtaining mission numbers). It was further suggested that advance specifications for routine requests be agreed to in the form of memorandums of understanding.

Communities reported the ATC-20 damage assessment method and OES's volunteer inspector program to be very important and helpful. At the same time, improvements in the method and program were widely suggested. In several cases, the process became highly controversial and very difficult to manage. A system is needed for accurate posting of damaged buildings and postings should be in all appropriate languages. The system should be adopted universally and qualified persons—including out-of-town inspectors and structural engineers—should be trained in the inspection and posting procedures. The forms should be easy to use and structured for compatibility with computer data management systems.

The State should develop guidelines on procedures for informing building owners and tenants of their options for gaining access to severely damaged buildings and for retrieving inventories and personal belongings. The guidance should be developed in consultation with local emergency services directors, city attorneys, State OES, and FEMA representatives. Local coordination between the business community and government after a disaster is essential, especially in view of the need for good relations during disaster recovery. The paramilitary management style that is effective

for emergency response does not work in the longer term recovery period.

COMMUNITY RECOVERY

The communities were unanimous in calling for flexibility in implementing disaster assistance programs to facilitate coordination with local programs and staff and adaptation to local practical realities. The community reports had many examples of inappropriate or troublesome programmatic applications. Design and management of recovery programs should be as simple as possible. Current program administration is too complex. Administration is decentralized, diffuse and enormously encumbered with required paperwork and demands for documentation. In short, the disaster assistance application and review processes need a thorough overhaul.

Several communities called for revising State and federal assistance relating to temporary housing assistance (long-term shelter needs). The assistance guidelines have only limited applicability to the timely replacement of damaged buildings that house low-rent housing units. In a major urban earthquake, thousands of such units will be severely damaged and destroyed. In many cases, marketplace economics will not support replacement of this housing at all, let alone as low-rent units.

Thus, thousands of tenants will be effectively and permanently displaced from housing, and there are currently no State or federal disaster assistance programs to deal with a housing problem of this nature or magnitude. One community suggested distribution of block-grant money through local housing agencies as a partial solution to this problem.

Confusion and associated time delays were widespread concerning local jurisdiction costs that FEMA would or would not reimburse. Several communities called for State/federal guidance on the types of costs that would be considered eligible for reimbursement. From observing this process in the Loma Prieta earthquake, some jurisdictions concluded that many State/federal Public Assistance Program decisions were unnecessarily arbitrary. Some also found the dollar amounts ultimately paid insufficient to cover legitimate costs.

Although the premise of federal disaster assistance funding is replacement of damaged or destroyed facilities "in-kind," aid needs to be available for "reasonable betterment." It was suggested that some kind of loan program be established by the State and made available to local governments to pay for replacing such things as old and inadequate storm drain systems. Even though they may have been only partially damaged they cannot merely be patched up for future use in a downtown area being rebuilt.

Some basic redevelopment legislation should be written and ready for adoption in an emergency, or else be adopted in a generic form and ready for quick modification to meet postearthquake needs. One city estimated that availability of such State legislation "on the shelf" would have helped avoid a lot of uncertainty and as much as six months delay in recovery financing.

The State should require local jurisdictions to develop community recovery plans with at least as much emphasis as is currently placed on immediate emergency response. Recovery is much more complex than immediate response, and in most cases will result in more dramatic and longer-lasting implications.

When damage is widespread, local jurisdictions, particularly smaller ones, lack capacity for unilateral response to the recovery needs of their communities. Local plans should be developed to include adopted postearthquake recovery policies certified by the State for the long-term community recovery. Such plans and policies should address at least the following topics:

- Specific plans for providing consistency with State or federally mandated hazard mitigation plans
- Standards for the repair of damaged buildings, including historical buildings

- Criteria for the demolition of severely damaged buildings, including historical buildings
- Standards for acceptable alteration of discretionary land use approval processes
- A State policy outlining and defining the range of local discretion expected to be exercised in recovery and reconstruction land use policy
- Criteria for requiring stricter-than-normal standards in land use and construction, where justified by postearthquake data
- Pre-earthquake review of financial regulations for local government budget and accounting procedures, to assure the expeditious conduct of local government business in response and recovery

Finally, it was commonly observed that owners who had earthquake insurance were able to avoid many delays and other problems. This, in turn, reduced the recovery workload and level of monetary need from disaster assistance programs. Accordingly, several communities suggested that the State find ways to encourage owners to purchase earthquake insurance.

The six sections that follow were written and made available by jurisdictions affected by the Loma Prieta earthquake. While the material has been edited for language and style, the contents as submitted, expressing frustrations, along with suggestions and conclusions, remain intact.

Town of Los Gatos[28]

The Town of Los Gatos is located in the foothills of the Santa Cruz Mountains and covers about 11 square miles, including hillsides as well as flatland areas. The population as of January 1, 1990, was 28,197. The October 17, 1989, the Loma Prieta earthquake caused significant damage to the Town. The building stock in Los Gatos is comprised of many pre-1900 structures, particularly in the downtown. Many residential structures were damaged because they either did not have a foundation, were not bolted to the foundation, or had a pony or cripple wall failure. There are also a number of unreinforced masonry (URM) commercial buildings in the downtown area which sustained damage.

One of the biggest causes of damage to residential properties was cripple wall failure, especially in the old Victorians. Some of these homes jumped off their foundations and dropped three to four feet when cripple walls collapsed. In Los Gatos, homes that were bolted but did not have adequate shear walls sustained more damage than homes that were not bolted at all. Then Governor Deukmejian vetoed a bill that would have required older residences to be bolted to their foundations and the installation of shear wall panels wherever necessary. The primary basis for this veto was a concern that the cost of mandatory retrofitting would pose a burden for especially fixed-income homeowners. The Town recommends that this issue be reconsidered. At the very least, residences should be required to have shear strength and the foundation bolted at the time of resale.

BUILDING PERMIT PROCESS

It is important for cities and counties to develop policies on procedures that will be used in an emergency before a natural disaster occurs. A clear vision of where the community wants to go and where it wants to be is essential. The Town had not done this prior to the earthquake, and had to scramble to prepare and adopt new policies following the earthquake. The Town Council held an emergency meeting on the Sunday after the earthquake to establish policies for earthquake repair and restoration. A restoration program was established to handle various earthquake-related applications, such as demolitions, reconstruction of structures, relocation of displaced businesses, and obtaining approval to use a motor home or trailer as temporary housing.

Fortunately the Town Council had a clear idea of what it wanted. The Council adopted

28 Submitted by the Town of Los Gatos, Department of Planning.

Urgency Ordinance 1800 which established the Earthquake Restoration Committee (ERC) and policies governing demolition, repair, and reconstruction of damaged buildings and unreinforced masonry structures. Urgency Ordinance 1801 provided for the demolition of dangerous property. The Council stressed that, wherever possible, buildings should be repaired rather than demolished. Many owners demolished only a portion of a damaged structure rather than razing the entire building. Of the more than 800 damaged structures, only three commercial buildings were completely destroyed as a result of earthquake damage. Twenty-five residential structures had been approved for complete demolition as of January 1, 1991. Two commercial and eleven residential buildings approved for demolition were considered to be historically significant.

To assist property owners, the Town's Planning Department developed the following handouts:

1. Guidelines for Repair and Reconstruction of Earthquake Damaged Buildings
2. Application Procedures for the Demolition of Residential/Commercial Structures
3. Administrative Procedure for Temporary Housing Due to the Earthquake
4. Application form for the relocation of businesses displaced by the earthquake, or repair or reconstruction of a demolished structure (ERC approvals)

A property owner has two options for reconstructing a building which was partially or completely demolished. The Town Council's *Guidelines for Repair and Reconstruction of Earthquake Damaged Buildings* specify that replacement structures are to be identical in size and use to the original structure, or in cases where remodeling was done, they may be rebuilt as they previously existed. Up to 100 square feet of floor area may be added to residential buildings under the restoration process. If an applicant proposes to construct a replacement structure that is substantially different from the original, or to add more than 100 square feet to a residence, the regular development review process was required. That process involves a public hearing and reviews by the Development Review Committee, Historic Preservation Committee (if designated as historic or a pre-1917 structure), and the Planning Commission. In addition, any applicable planning and building fees are assessed. The intent of the Council's policies was to get the Town back to what it was before the earthquake. The fee waiver and streamlined review were offered as incentives to property owners to encourage rebuilding what they had prior to the earthquake, with a minimum of time and cost.

The Town Building Department established a fairly complete list of damaged properties shortly after the earthquake. On November 6, 1990, a letter was sent to approximately 300 property owners who had not applied for building permits advising them of filing deadlines to qualify for fee waivers. On November 16, 1990, a letter was sent to owners already having building permits advising them to get an addendum to their permit (or to obtain a new permit if any additional work was to be done above that for which the original permit was issued). Advertisements were also placed in local newspapers to alert property owners of filing deadlines. The Town encouraged property owners with questions or unusual circumstances to talk with staff regarding their specific situation.

In spite of these efforts to notify property owners and encourage them to start the restoration process, there were, as of January 1991, approximately 200 properties which were "yellow"- (limited entry) or "red"- (building unsafe) tagged that had not notified the Town of their intentions regarding repairs.

BUREAUCRATIC DELAYS

Although the restoration process has been very successful and many damaged buildings have been repaired or rebuilt, the Town is confronted with a number of problems. There are many property owners who have not yet

approached the Town for information or to submit an application for repair work. One reason for this is people have had a very hard time reacting and making decisions. Fifteen months after the earthquake, there are property owners who are still waiting for approval of loans, or for insurance settlements. Public sector funding for earthquake repairs has been almost nonexistent. Few owners have obtained Federal Emergency Management Agency (FEMA), Small Business Administration (SBA) or California Disaster Assistance Program (CALDAP) loans. So far, 25 CALDAP loans have been approved and funded by the state and two property owners have received Red Cross grants of $30,000. It has been very frustrating for both staff and property owners who cannot otherwise proceed with restoration projects. The question of whether earthquake insurance should be mandatory has been a major issue in Los Gatos. The owners who had earthquake insurance or were independently able to finance their projects are the ones who have been most successful in getting their businesses reopened, and/or getting damaged structures demolished, reconstructed or repaired.

Another unforeseen problem is how to handle normal activities in addition to dealing with the emergency situation. Only a few days after the earthquake, contractors were in the Building Department requesting inspections and permits for ongoing projects, and residents were requesting approval of business licenses and home occupations from the Planning Department. People who are not personally affected by the crisis expect to receive the same service that they usually get.

HISTORIC PRESERVATION VS. DEMOLITIONS

Historic preservation is an important issue for some jurisdictions like Los Gatos which have a significant number of older structures. It is important to establish policies to protect historic buildings. FEMA put pressure on the Town and on individual property owners to demolish structures right away before they could even be properly inspected and evaluated. The only buildings which should be immediately demolished are those which present a public safety problem or are in danger of falling on neighboring structures. In most cases, severely damaged buildings were able to be shored up or fenced off to eliminate any hazard. The three commercial buildings which were demolished were taken down within thirty days of the earthquake because they were endangering adjacent properties. The bricks from these buildings were saved to be reused on the replacement structures. One of the three is presently being reconstructed and will be sliced the original brick for use as a veneer on the front elevation. It seems a disservice to have FEMA and other agencies push to have buildings torn down right away, as long as life and safety can be protected.

DISCREPANCIES IN REPAIR ESTIMATES

Another problem is getting the experts to agree on what should be done with a particular building. As an example, a major historic commercial building in the downtown was significantly damaged. Known as the La Canada Building, it is a landmark located at the corner of North Santa Cruz Avenue and Main Street. The owners had six different engineers inspect the structure before they found one that could save the building at an economically feasible price. The original estimate for saving the building was $6 million. VSL Corporation was able to retrofit the building for seismic safety and at the same time preserve the historic value for about $1 million. Another positive result is the property owners will now be able to get insurance for the building (the structural engineer was able to demonstrate that the structure will be safe and will meet enough of the current building code to make it insurable).

A second historic building, the Rankin Block, was proposed to be demolished and rebuilt. Two different structural engineers disagreed about the costs of seismic retrofit and restoration

versus demolition and reconstruction. The Town Council ultimately denied the demolition permit, relying on expert information from the State Office of Historic Preservation's structural engineer rather than expert information from the engineer hired by the applicant. It would be very helpful to get representatives from various fields to meet to discuss the issues involved in restoring historic buildings. Historians, architects, structural engineers, building inspectors, contractors, bankers, and insurance companies could each give their own perspective on historic preservation for the benefit of the other professionals. More importantly, the establishment of guidelines would be easier and they would be more effective.

LOSSES AND COSTS

The Town of Los Gatos has lost a significant amount of revenue due to businesses not reopening or relocating outside the Town, and waiving of building and planning fees. About $700,000 was lost in revenues in 1990, which was more than expected. Expenditures for the Town were also uncommonly high (about $1.4 million). It is anticipated that for the fiscal year 1991 additional expenditures will be $1.3 million and loss revenues will be $560,000.

City of Oakland[29]

EMERGENCY MANAGEMENT SYSTEM

Cities, counties, the State, special districts and the private sector must work together to develop a standardized and coordinated emergency management system. The City of Oakland recommends accomplishing this through the development of mutual aid systems which extend beyond fire and law enforcement.

In addition to focusing on response categories of mutual aid, Oakland supports the "sister city" concept of developing mutual aid agreements with cities and counties in different areas of the state that are unlikely to be impacted by the same disaster. For example, the City of Oakland could develop a mutual aid agreement with the City of Long Beach. These cities are similar in population, demographics, and available resources. Under the agreements, the cities in the unaffected areas would assist their "sister cities" in the affected areas in the event of a disaster.

While the Emergency Management Operational Area concept, which identifies counties as operational areas, is an appropriate management system for cities which are without full-time emergency services departments, it is not an effective or appropriate system for large cities (population over 300,000). In the case of Oakland, the City has a full-time Office of Emergency Services, and it is not practical to work through Alameda County Sheriff's Department (which employs two coordinators to manage the County's OES and coordinate response for 14 cities). It would be more appropriate for Oakland, perhaps in conjunction with Emeryville, Alameda, and Berkeley, to be considered a separate operational area.

The current procedures developed by FEMA and State OES for the procurement of federal resources by a local jurisdiction are cumbersome and confusing. The current process is if the City needs a federal resource, it makes the request through the County. The County passes the request to the State O.E.S. Regional Office. The Regional Office then forwards the request to State OES in Sacramento, which finally submits the request to FEMA Regional Office in San Francisco. FEMA Regional Office may then need to secure permission from FEMA Headquarters in Washington. If at any one of these steps clarification or further information is needed, the questions need to be filtered down in the reverse order. Assuming the resource is available and permission is granted to use it (i.e., military supplies, equipment, etc.), FEMA must assign a

[29] Submitted by the City of Oakland, Office of Emergency Services.

"mission number" before the resource is released.

Following the Loma Prieta earthquake, the City of Oakland followed this procedure in its request for the use of military barracks to house earthquake victims. The barracks were never made available, even though several requests were made, and the need existed for over three months.

The City of Oakland recommends the elimination of the multilayered request for resource procurement, and the development of memorandums of understanding (MOUs) between federal and state resources and the local jurisdictions in which they reside. These MOUs will identify what resources are available and outline procedures for their procurement.

As a provision for receiving Emergency Management Assistance (EMA) funds, the State should require that local OES offices be located in the organizational structure of the Chief Administrative Officer, be it mayor, city manager, county administrative officer, etc. This would insure that the local OES has the administrative authority to carry out it's functions.

Oakland recommends that the State work with local jurisdictions to assist with the development of the Incident Command System for coordinating response activities, and where appropriate, to manage the Emergency Operations Center.

Of essential importance to the management of a disaster is the development of effective emergency operations centers (EOCs). To insure the creation of effective EOCs in local government, the City of Oakland supports the reintroduction of Assembly Bill (AB) 2704 (Speier)—Disaster Relief: Local Government Emergency Operations, which would require the State Office of Emergency Services to conduct a survey of city and county governments to determine if there is a need for state financial assistance for the expansion, renovation, or construction of local governmental emergency operations centers. This bill was vetoed by Governor Deukmejian on September 27, 1990.

EMERGENCY COMMUNICATIONS AND PUBLIC INFORMATION

The Emergency Broadcast System (EBS) was not an effective method to disseminate information to the general public in the event that normal channels of communication are disrupted. In a disaster where all, or the majority of the media are still in operation, EBS is virtually useless because it "competes" with other radio stations.

The Loma Prieta earthquake showed how difficult it was to conduct rumor control through the non local media. There was little to no control of the network media by the local stations. If local OES offices can establish better working relationships with their respective media offices, the dissemination of information during a major event can be more effective. Emergency public information training programs designed for both news directors and emergency managers are recommended.

The City of Oakland recommends using the Emergency Digital Information System (EDIS) to deliver messages of life safety warnings, public information statements, and media advisories. Further, the City encourages the State to assist in making EDIS more accessible to local governments.

Oakland recommends the reintroduction of Senate Bill (SB) 2058 (Kopp), which would require the Office of Emergency Services to establish the emergency digital information system. Further, OES would be required to provide digital radio receivers to key media outlets for the receipt of messages from government agencies.

The State of California could offer emergency public information workshops at the Regional Offices. While the California Specialized Training Institute (CSTI) conducts an excellent course on Public Information, it is cost prohibitive for many jurisdictions.

Although local government should assume the responsibility to work out agreements for the dissemination of information during a disaster, the State should take the lead in working with broadcasting agencies (such as the

California Broadcasters Association, and the Press Clubs of Los Angeles and San Francisco) to improve emergency public information and media coordination.

MASS CARE AND SHELTER

The State Department of Social Services has the lead responsibility, and the Department of Education has the support responsibility, for coordinating mass care and shelter at the State level. The Government Code designates public schools as locations for emergency shelters. Local school districts would be better prepared to assume this responsibility and to work with local OES, if they had guidance from these state agencies on how the process is supposed to work. This was a major problem in Oakland when the local schools were not prepared to accommodate the earthquake victims.

Additionally, the State must coordinate with local government, the Red Cross, FEMA, and community groups to provide for the sheltering of nontraditional, multicultural groups, many of whose needs were poorly met in the Loma Prieta earthquake.

In developing sheltering plans, the State and local governments must consider the long-term sheltering needs. Most plans consider sheltering to be a short-term responsibility. However, the Loma Prieta earthquake revealed that persons displaced by the disaster, especially those residents of low-income housing units, require long-term shelter. In Oakland many residents still require shelter, over eighteen months after the earthquake.

Mass care and shelter plans must allow for the rapid establishment of short-term shelters, and the ability to transfer persons to long-term shelters, when facilities become available.

RECOVERY

In the majority of cases, the FEMA field representatives were from out of town, out of state, or were nonemergency services professionals. Needless to say, these individuals were not familiar with the City or the subcultural characteristics of the populations that were most heavily impacted.

The City recommends that the State work with FEMA to adopt the State OES policy of assigning the same personnel to work with local jurisdictions on a regular basis. A familiar name and face are very important during a disaster. Establishment of the Disaster Application Center (DAC) was both timely and expedient. FEMA's decision to place the DAC in Oakland, which was a heavily impacted jurisdiction, was especially appropriate. Public information and advertising of the center was fair, however; more effort should have been made to address the non-English-speaking groups. Although FEMA was flexible in some areas, including the extension of filing deadlines, its rigidness on disaster assistance rules resulted in negative criticism. For example, FEMA's requirement for residency eligibility caused one of the most complicated problems in Oakland. The residents of the Single Room Occupancy (SRO) hotels could not meet FEMA's requirement for 30-day residency. Due to City rent control rules, the practice of the SRO landlords is to move the residents from a given room every 28 days or less. Because of this administrative quirk, these residents were disqualified for FEMA assistance.

The City would like to coordinate with other jurisdictions, the State, and FEMA to develop disaster assistance rules and application procedures that are sensitive to the special needs populations.

PUBLIC ASSISTANCE

The issues of recovery go beyond the emergency period. It is necessary to be clear and consistent with the eligibility requirements which address reimbursement to local jurisdictions for expenses incurred while responding to the emergency.

Throughout the recovery period, some FEMA regulations have changed, or have been interpreted differently by various inspectors and

Regional Office reviewers. Further, due to the limited FEMA staff, representatives assigned to Oakland are often reassigned to other disasters. This causes delay and confusion while the newly assigned representatives become familiar with Oakland's applications and appeals, frequently requiring the entire process to begin again.

While FEMA has standard labor rates for reimbursement, many of these rates are unrealistically low given the Bay Area's high cost of living. Although FEMA has recognized this in principle, inspectors often fail to apply this principle when preparing damage survey reports (DSRs) for the City.

Improved coordination between FEMA and the State OES Disaster Assistance division and respective regulations would help to ease the recovery and reimbursement process. On occasion, FEMA will not recognize State requirements, such as those imposed by the State Historical Preservation Office (SHPO), which makes the evaluation of recovery projects especially difficult.

PRIVATE ASSISTANCE

Over fifty small businesses in the downtown area have remained closed since the earthquake. Economic injury is estimated at over $20 million, annually. Small Business Administration (SBA) loans could not adequately address the problems. In many cases the businesses have not been able to relocate and recover. These individuals need long-term recovery assistance, rather than one-time grants or loans.

FEMA initially denied all claims from low-income shelters (single room occupancy hotels). As a result of a class action lawsuit filed by the Alameda County Legal Aid Society against FEMA, an agreement was reached to provide Alameda County with $11.58 million for the purpose of providing housing either through rehabilitation of existing buildings or housing vouchers for people displaced by the earthquake. While this agreement will provide some assistance, it will not address the needs of all those displaced. The cost estimate to replace low-income housing lost in the earthquake is almost $27 million. Of the approximately 2,500 Oakland residents made homeless as a result of the earthquake, 1,500 are still without permanent shelter. The stock of affordable housing has decreased significantly, while the number of shelter beds in Alameda County has increased by only 100.

In addition, FEMA requires that the entire settlement amount be expended within one year of the settlement which is an unrealistically short period for developing an effective program and conducting the rehabilitation work. Amending the FEMA requirements for residents of low income housing, to include SROs will better facilitate the assistance to those individuals and avoid litigation.

CALIFORNIA DISASTER ASSISTANCE PROGRAM (CALDAP)

While the CALDAP program provides financial assistance to repair or replace owner-occupied housing, and to complete other necessary repairs to bring a home into compliance with local code requirements, the program was unable to assist commercial property owners with repairs. Commercial establishments in Oakland, many of which house single room occupancy units for low-income residents, are left with no means to finance rehabilitation work. Therefore, it has been especially difficult for the City to rebuild its low-income housing units, 95 percent of which were damaged by the earthquake.

An amendment to CALDAP, or a revision of State regulations, may need to be enacted in order for commercial businesses, particularly mixed-use residential commercial property, to participate in the program.

Many rental property owners have complained that the CALDAP-R program, which provides deferred payment property rehabilitation loans to owners of rental housing developments that were damaged or destroyed by the earthquake, has failed to provide

assistance in a timely manner. Because the program requires evidence that borrowers have sought financing from other disaster assistance programs, such as FEMA, many have waited over a year for a response from CALDAP-R.

It is recommended that the State review and revise the requirements for CALDAP-R to ensure that assistance can be provided in a timely manner.

RECOVERY LEGISLATION

1. 1/4 Cent Sales Tax for Earthquake Recovery (Assemblyman Rusty Areias).

While this special legislation was successful in generating almost $800 million in revenue, this amount cannot adequately address the recovery needs of the affected area. Given the State budget deficit, and the mood of the California electorate, recommending a permanent sales tax increase for earthquake recovery, mitigation, and preparedness may not be appropriate at this time. However, the City of Oakland would advocate that a lesser fraction sales tax increase, perhaps 1/16 of a cent, be enacted at a later date.

2. Economic Recovery Provision of the 1974 Disaster Assistance Act (Public Law 930288, Title V)

This legislation makes available, through the U.S. Department of Commerce, a maximum of $250 million to jurisdictions which experience negative long-term economic effects as a result of a disaster. Because the Economic Recovery Provision has never before been implemented, activating it has proven to be very difficult. FEMA attorneys originally contended that this legislation did not exist. San Francisco City Attorney's Office was successful in determining its existence.

In August 1990, Mayor Art Agnos of San Francisco requested that former Governor George Deukmejian recommend the implementation of this legislation. Although the former Governor did not respond to the request, both the State Office of Emergency Services, and the State Controller's Office are now helping local jurisdictions to provide documentation on the economic effects. In addition, cities and counties affected by the Loma Prieta earthquake are meeting regularly to discuss, among other issues, the strategy for accessing this legislation. Local representatives have met with members of Congress to lobby for the implementation of this legislation. Oakland encourages the State to pressure the Federal government to implement this legislation.

PREPAREDNESS

Volunteers. The Loma Prieta earthquake revealed that volunteers can be a very valuable resource. Citizens selflessly assisted with response and recovery efforts at the collapsed Cypress structure in Oakland, in San Francisco's Marina District, and in other affected areas. Because it is known that volunteers will respond to subsequent disasters, it is in the City's best interest to train these residents in disaster response to make them an even more valuable resource.

To this end, Oakland has developed a three-module training program, entitled CORE—Citizens of Oakland Respond to Emergencies. Under this program, Oakland residents are trained in Individual and Family Survival (Module 1), Organizing Volunteer Response Teams (Module 2), and Advanced Citizen Response, Basic First Aid, Fire Suppression, and Light Search and Rescue (Module 3).

Although the City of Oakland has dedicated the resources to support the program, and OES personnel have provided the training, the City requests that the State help to provide the funding to equip the volunteer groups with the necessary supplies for earthquake response.

The State may consider following up on the Natural Disaster Volunteer Corps Program (AB 3568—Areias), which requires the State Office of Emergency Services to develop a plan for state and local governmental agencies to use volunteer resources during a disaster. To make this report more effective, legislation may be developed to appropriate additional funding for

the training and implementation of the plan. Guidance for the registration and identification of volunteers prior to disasters must also be included in the plan. Finally, a mechanism for managing both trained and spontaneous volunteers should be in place.

Schools. Oakland urges the passage of AB 335, which would establish a train-the-trainers program to train school district emergency coordinators to instruct school personnel in earthquake emergency procedure systems. This legislation would require the State Department of Education and the Office of Emergency Services to jointly develop and administer the program.

Training. Through the California Specialized Training Institute and State OES regional meetings, the State should continue to provide adequate training to emergency services personnel.

MITIGATION

Hazard Mitigation Grant Program. Within strict dollar limits, the Stafford Act provides that the federal government will fund 50 percent of approved hazard mitigation projects for jurisdictions in disaster declared areas. Local government and other applicants are responsible for providing the 50 percent match. The amount expected to be available under the Loma Prieta earthquake for hazard mitigation grants is approximately $30 million. While this grant program provides some assistance in the area of hazard mitigation, it is far from adequate.

Oakland recommends that the State develop its own Hazard Mitigation Grant Program. In addition to providing funding in the area of hazard mitigation, the State's program would focus on priorities identified by the State of California, many of which are ineligible under the federal program.

Financial Support From the State. To comply with the requirements of the State's Unreinforced Masonry (URM) Law (SB 547), the City is exploring financial assistance opportunities to help owners with the cost of building modifications. This includes consideration of traditional financing alternatives such as bonds or assessment districts and development of new funding sources, possible at the State level. This might be done in conjunction with other major cities in California with large numbers of URM buildings.

City and County of San Francisco[30]

Nine of the eleven deaths in San Francisco attributed to the Loma Prieta earthquake resulted from partially collapsed or severely damaged buildings. Many of the injuries and economic impacts of the earthquake are also directly related to building damage and there are lasting social and economic effects. The loss of housing, particularly housing for those with low and moderate incomes, has exacerbated an existing shortage of residential units. The costs of repairing and rebuilding damaged private and public buildings, and improving both damaged and undamaged buildings so that they will survive future (and larger) earthquakes, is too large to be borne locally.

The following discussion of San Francisco's experience since the Loma Prieta earthquake is organized into the general types of activities undertaken by government as a result of this earthquake: Life Safety (fire suppression and search and rescue); Building Safety (immediate inspection and posting of structures); Information Management; Shelter and Temporary Housing; Recovery (the Individual Assistance Program and the Public Assistance Program); and Hazard Mitigation. It concentrates on the activities in which there is a substantial State, or shared local/State/federal

[30] Submitted by the City and County of San Francisco, Department of City Planning.

responsibility, and on those activities where experience uncovered shortfalls of resources, inadequate preparation, or lack of coordination. In each section a short discussion of the events following the Loma Prieta earthquake and an identification of problems which occurred precedes the general recommendations for future State actions and policies.

San Francisco's Loma Prieta experience shows that the design and management of recovery programs should be as simple as possible. Problems arose when programs were complex and numerous, and when many different agencies and levels of government were involved. The needs of victims could be better and more efficiently served if programs could be administered closer to the local level and with considerable local involvement.

The local involvement that San Francisco recommends should be part of a comprehensive preparedness and response program tailored to local needs. The National Earthquake Hazards Reduction Act includes "hazard identification, vulnerability assessments, preparedness and response planning, mitigation planning and public awareness/education" among the eligible activities which it will fund (on a cost-sharing basis). Because the Act treats "local units of government and or substate areas that include a number of local government jurisdictions" as definitionally equivalent to State agencies, we believe that this program could directly fund these local efforts, in addition to its funding for State agencies. In order to avoid the problems of excessive and duplicative documentation requirements and interagency procedures, this funding should be provided as a "block grant." It should be conditioned on the operation of an effective and efficient overall earthquake preparedness program, rather than on the examination of each small piece of the program against very specific eligibility standards.

This is not to say, however, that there should be less State involvement in preparation for, and recovery from, disasters. The State of California should, in cooperation with local agencies, design programs and systems which could be implemented on the local level and train local staff. For example, OES is better prepared than most localities to design a model citizen volunteer training program, which could be used by cities and counties.

Part of the State-level program should be the development of standards to be met by local agencies participating in disaster recovery, in order to assure that localities are well prepared to carry out the responsibilities that we have advocated they be given. These could include standards for and oversight of local preparedness plans and organizations, mitigation programs, and postdisaster administrative structures.

Finally, many State programs were instituted in response to the Loma Prieta earthquake, and are being funded by the temporary sales tax increase. The State, as well as local governments, should have legislation in place, including programs and revenue sources, which could automatically take effect or easily be enacted in response to an emergency. For example, after a declared emergency when damage estimates exceed some predetermined level (perhaps $500 million) a temporary sales tax increase could occur automatically.

LIFE SAFETY

Immediately following the Loma Prieta earthquake, emergency response was provided by municipal response organizations, and primarily by the San Francisco Fire Department. The Fire Department responded to 34 fires between 5:04 p.m. on October 17 through midnight on October 19. All resulted directly or indirectly from the earthquake. The Fire Department, with the help of citizen volunteers, also engaged in search and rescue efforts where buildings had collapsed. The Fire Department response to fires and collapsed buildings was generally according to standard operating procedures. Deficiencies in communications and firefighting infrastructure have been identified by the Department, and will be addressed within ongoing Department and City processes,

as well as within FEMA's Hazard Mitigation Grant Program administered by OES.

Fire Department staff also identified some areas in which state or regionwide planning and coordination could improve response. Fire, Police, and Emergency Medical Services staff are well trained to carry out their emergency functions. However, in a major disaster a much larger pool of people trained in fire suppression, first aid, simple search and rescue, and building safety than is currently available will be needed. It should include both nonemergency city staff and citizen volunteers, and be able to work under firefighters' direction or independently. Many neighborhood groups have expressed interest in being trained in emergency response. The Fire Department has begun a training program which involves fifteen hours of training. The department trained 24 citizen volunteers in its first year. Clearly, larger scale effort is needed, but is currently beyond available local resources.

The State is currently developing a program to assist local governments develop civilian volunteer training. The State, as part of its responsibility for education and information dissemination, should aggressively promote the establishment of local citizen volunteer training programs. This could include funding local training programs, providing manuals and teaching materials to local agencies, training the local trainers, providing equipment to citizen volunteers, perhaps including a training session for citizen volunteers by the California Specialized Training Institute.

In some cases, essential City staff, including emergency responders, were unable to travel into the City immediately after the earthquake. Had the Golden Gate Bridge been out of service, this would have been a much more severe problem. The State should facilitate an intraregional system, including local governments and public and private transportation providers, to immediately transport essential personnel to and from predetermined points after a major disaster.

BUILDING SAFETY

The Bureau of Building Inspection (BBI) was responsible for the categorization of damaged buildings, and for immediate decisions about the safety of damaged buildings. BBI, with the help of volunteer inspectors, used the Applied Technology Council's ATC-20 system to classify buildings as "red" (unsafe), "yellow" (limited entry), and "green" (no restriction on use or occupancy). Over 18,000 inspections were performed after the earthquake.

As of a month after the earthquake, 234 buildings had been red tagged. Fifty-five of these buildings had already been removed from this category by being demolished, secured, repaired, or reinspected and recategorized.

By August 1990, ten months after the earthquake, 369 buildings had been red-tagged, and seven remained in that category. Fifty-one buildings which had been identified by the Bureau of Building Inspection (BBI) as unsafe had been demolished. Thirty-five of the fifty-one demolished red-tagged buildings were residential buildings, containing a total of 512 units.

Seventy-eight buildings are currently categorized as "secured" (this term is not part of the ATC-20 system). Secured buildings are unoccupiable. Of these 78 buildings, 51 contain residential units, with a total of 591 units. Thus, over 1,100 residential units have been removed from use by demolition or securing.

Approximately 1650 buildings, including about 730 residential buildings, were yellow-tagged after the earthquake (this includes about 90 buildings which had been red-tagged and reclassified to yellow, and are among the 369 buildings discussed above). Very few of these buildings have been demolished. (To put these figures in context, there are about 120,000 buildings in San Francisco. About 1.6% of the total building stock was at some point yellow-tagged or red-tagged.)

Many other buildings sustained nonstructural damage such as cracked plaster and broken glass, and were not classified red or yellow. The

costs of these repairs will be borne primarily by property owners and tenants.

A disproportionate share of the 1,100 residential units lost or unavailable for extended periods had housed low and moderate income people, including several single room occupancy hotels. Because of the previously existing shortage of low-cost housing, this loss will result in a long-term social impact, and was one of the major impacts of the earthquake on San Francisco.

BBI identified several deficiencies in the ATC-20 system and developed some new categories in addition to the red, yellow and green categories set out by ATC-20. These observed problems should be given the highest degree of consideration in OES's current evaluation of the program. San Francisco's BBI developed a new category, "Secured," that is being used for buildings which do not create a hazard to adjoining structures or to any street or public way, but which are unsafe for occupancy or use. A building classified "Secured" is tagged neither red nor yellow. Examples of secured buildings are those where work under a building permit has been completed to shore up, brace, partially demolish or otherwise secure the building, or when it's source of danger is another building nearby.

A major problem was confusion as to the meaning of "yellow—limited entry." This classification was changed to mean that "certain designated areas or portions of the building may be unsafe, building may be entered and occupied." This classification is used for buildings which do not present an immediate hazard, but which require repairs. These changes would require a reevaluation of the ATC original concept of a sequence of detailed inspections, with buildings moving through mutually exclusive categories of red to yellow to green.

The State OES assisted San Francisco by providing volunteer inspectors from outside of the City. While the volunteers themselves were extremely helpful in the immediate postearthquake period, OES did not provide for enough necessary coordination for their support (transportation, food, shelter). In future disasters where outside volunteers are used, the process would be smoother if each group of volunteers organized by OES included a "group leader" to provide logistical and organizational support.

INFORMATION MANAGEMENT

City officials were confronted with enormous demands for information from the media, the public and from state and federal agencies. Timely estimates of damage, injuries, and displaced people were needed for response and recovery efforts. The City had little data analysis capability.

The State of California should address this problem by working with local agencies to develop standard reporting systems, perhaps by having available standby computers programmed to handle disaster data, and by training local agencies in reporting systems before a disaster.

SHELTER AND TEMPORARY HOUSING ASSISTANCE

The immediate response to the needs for social services (food, shelter, temporary housing) within the first few hours after the earthquake were addressed by federal agencies and the Red Cross. These agencies' responses, while necessary and welcome, seemed to be designed for a different cultural setting than San Francisco, and did not take into account local living patterns. Their rules and regulations were based on an image which in some ways was not reflected in San Francisco, where earthquake victims included people with different cultural backgrounds and languages, different economic resources, some who lived in single room occupancy hotels, and some with existing substance abuse or mental health problems. As a result, many needs for social services for earthquake victims were unmet or inappropriately met.

Those charged with emergency sheltering lack knowledge about local conditions which

contributed to some unfortunate policies. For example, FEMA determined that only those who had occupied their housing units for 30 days were eligible for housing assistance (although the Stafford Act states that the unit must be one's "principal residence" with no specified time limit). Local officials knew that for a substantial population, single room occupancy hotels (SRO) are the principal residence, even though these rooms may be occupied for less than 30 days at a time. The City, had it had the major responsibility and preparation to administer the temporary housing program, would have better been able to meet the needs of this portion of the population, for whom the Loma Prieta earthquake exacerbated an already grim situation.

The temporary housing assistance program is intended to provide "suitable" temporary housing until suitable permanent housing is available. Because the determinations of what constituted "suitable" housing, who was entitled to housing assistance, and how the program should be administered were made by persons having limited working knowledge of the San Francisco housing market or San Francisco resident patterns, misjudgments about how to handle many persons that were displaced by the earthquake were made. FEMA established a $950 monthly rental allowance for all households, regardless of size or of type of housing needed. Larger families found it impossible to find adequate housing in San Francisco at this rent. Federal agencies were also unwilling to maintain any flexibility in their programs. For example, they were unwilling to fund furniture storage costs, even when it resulted in a cost of less than $950 for housing a displaced household.

The temporary housing assistance program consisted primarily of subsidies to be used in the private rental market. In a large city with limited housing resources, such as San Francisco, this can be a difficult market to negotiate in the best of times. In situations where adequate private rental housing is not available, the Stafford Act authorizes the federal government to provide temporary housing, such as mobile homes or other readily fabricated dwellings, for disaster victims. These solutions were apparently not considered.

There was a need for a housing referral system for earthquake victims. This was not part of the FEMA model. The State should recognize this as an immediate postdisaster need in urban areas, and plan for including this service in local assistance programs. An ad hoc referral system was developed by the City and the Red Cross when the need became apparent. An effective program would include local government agencies, and nonprofit and private housing providers.

The federal legislation and regulations establishing the temporary housing assistance program specifically authorize states, and through the states, local jurisdictions, to take over substantial administrative responsibilities. (44 CFR 206.101(s)). A state requesting such authority "must have an approved plan prior to the incident [and] must comply with FEMA program regulations and policies." It also provides for funds for technical assistance to states to make this possible. The State should aggressively pursue this avenue. Local agencies could much more effectively implement temporary housing programs because their staffs who have familiarity with local conditions could be immediately available.

RECOVERY

The primary funding sources for postearthquake recovery are agencies of the federal government, including the Federal Emergency Management Agency (FEMA), the Small Business Administration (SBA), the Department of Education, and others. The administration of some of these programs, including the application and disbursement procedures, is performed by those federal agencies. Other federal programs are administered by state agencies, or by local governments working through state agencies. State programs are generally intended to supplement, rather than duplicate or replace,

federal programs. In general, this concentration of administration responsibility at the federal and state levels resulted in inefficient and untimely response to the needs of victims, including residents, businesses, and nonprofit and public agencies.

Administrative costs of administering all of these programs were (and continue to be) large for all levels of government. FEMA and SBA hired and trained new staff. Federal and state staff people from out of the area were brought in and maintained in the Bay Area at considerable expense. Inevitably, City employees and officials became involved, either because they alone could supply needed information, because the City was the applicant, or because they were approached by citizens who were unaware of or frustrated by the federal bureaucracy. This involvement was made the more difficult because San Francisco had had no prior experience or preparation in dealing with federal disaster response. When the complexity of this task became clear, the City hired one full-time, experienced federal recovery expert to train and coordinate other City staff who were to be involved in federal and State programs. About twenty City staff people devoted full time to these programs for about nine months. The Public Assistance Program reimbursements for these administrative costs did not cover the City's expenses.

City and County agencies, if adequately prepared, would have been better able to administer recovery programs and respond to local recovery needs. They have knowledge of and interest in local conditions and local culture, and motivation to achieve recovery. Because they are familiar with the area, and are on hand during and immediately after a disaster, they will likely have a better understanding of evolving disaster conditions. Active local involvement could have avoided some duplication of effort between those administering different programs. As an example of this kind of duplication, federal employees administering the SBA loan program had to inspect buildings to confirm that they had been damaged or destroyed. That information already existed in the records of the BBI.

In order to effectively exploit these local advantages, a systematic program to prepare for local involvement in the postdisaster administration of both the Individual and Family Grant Program and the Public Assistance Program, as well as other recovery activities needs to be established. Reimbursement for postearthquake local government staff involvement should also be provided. If localities chose to assume substantial postdisaster administrative responsibilities, the State should assist them in determining an effective administrative structure which assigns the responsibility for specific postdisaster tasks to specific local agencies. The State should provide an ongoing program of training in the requirements of state and federal programs. This recovery effort should be integrated into the comprehensive preparedness and response described in the first section of this report.

INDIVIDUAL AND FAMILY GRANT PROGRAM

The federal Individual and Family Grant Program is intended to provide housing assistance, grants and loans to renters, homeowners and businesses whose homes, buildings or personal property were lost or damaged. At least six different programs, with different points of contact, were operating in San Francisco after the Loma Prieta earthquake.

The time involved for individuals applying for individual assistance was sometimes excessive because of the large number of different agencies and regulations involved and their general lack of flexibility. For example, because of confusion about the scope of the authority and responsibility between OES, FEMA, HUD and the Department of Transportation, it took nine months to determine whether expenditures to repair a possible landslide affecting private homes, public land and streets were eligible for reimbursement, and by what agency. This delay

resulted in substantial hardship and costs to residents, and to the federal government which was funding temporary housing for these displaced residents. They are still displaced at the time of this writing—a year and a half after the earthquake.

Even in simpler situations, the time of victims and of those administering the programs was often wasted by lack of coordination between state and federal agencies. For example, the California Natural Disaster Assistance Program (CALDAP) was available only to those who had been denied federal aid. Even if it was clear that federal assistance would not be available, victims were required to go through the application process in order to be formally denied, a process which in some cases took up to six months, and which discouraged applicants. Separate damage inspections were required by the state program. Because these inspectors were more familiar with local code requirements and labor and material costs, this additional inspection often resulted in higher damage assessments, and strengthened some applicants' cases. But these additional inspections could only occur months after the federal inspections. Delegation of the initial inspection responsibility to localities would have saved time and money, for both the government and for earthquake victims. If the state loan application was approved after local screening, release of funds by the State Controller could add two months to the process.

Although local screening of possible applicants suggested that about 500 were potentially eligible, only 182 actually applied for the CALDAP program, suggesting a high degree of discouragement among victims. The total value of these loan applications was about $23.9 million. By July 1990, no state loans had been actually funded under this program, although staff processing and recommendations for approval of a number of applications had occurred. As of January 1, 1991 (over a year after the earthquake) only 14 loans, totaling $2.9 million (12% of the total applied for) had been funded.

The federal lack of familiarity with local conditions was reflected in a lack of recognition of the high cost of building in San Francisco by SBA inspectors, and of necessary related costs, such as required code work. Consequently, many of the approved loan applications were approved at dollar values well below the amounts applied for, based on unreasonably low federal cost estimates. The process for appealing these determinations was lengthy. This forced applicants to apply to the CALDAP program as well, which had more realistic cost estimates, as a de facto "appeals process."

The Mayor's Office of Housing conducted a survey of thirty owners of "red-tagged" multifamily properties in the Marina. Only one of these owners felt satisfied with the amount, terms, and timeliness of their approved loan. The remainder had often strong negative comments regarding the frustrations and futility of the experience. Several had been forced to sell property at a loss due to lenders' or investors' pressures, only to find out weeks later they had been given SBA approval. Frustration with the federal programs was so high that the U.S. Representative for the district had to assist over 200 constituents through the process. The terms and bureaucratic approval process were sufficiently discouraging that several persons contacted said their decision not to apply for the state loan (which might have been more beneficial) was based on "disbelief that they could ever expect any genuine help from any government entity."

Many of the multifamily rental properties in San Francisco had a higher replacement value than the maximum federal loan amount of $500,000. The average multifamily building that was severely damaged in the Marina contained 12 to 20 units, with a replacement cost, excluding land, ranging from $85,000 to $150,000 per unit. Although the state program was more realistic, by not setting maximum eligible amounts, applicants had to apply to and be rejected by SBA in order to apply to the CALDAP program.

While the State program included incentives, such as forgiven interest and principal, to

replace lost low-income units, the federal programs did not. Of the over 350 units in the July survey in the Marina, 10 percent had, prior to the earthquake, been rented at very-low-income levels. Many building owners expressed a concern that they could not re-rent units at those rates, given the terms of the federal loan program, but would have been willing to if there had been sufficient incentives. Most of the units lost in the Marina District were rental units, and all the replacement units will be condominiums in order to repay conventional or SBA loans. Therefore, federal recovery policy has actually led to the de facto conversion of hundreds of rental units, many of which rented at low- and moderate-income levels, to upper-income condominiums. This result is contrary to the policy of the Department of Housing and Urban Development (HUD) under nonemergency circumstances.

In enacting the Stafford Act, the Congress intended those displaced by disaster to receive temporary housing until suitable permanent housing was available, and it intended that permanent replacement housing be provided. There were 2,457 San Francisco households provided with temporary housing assistance by FEMA. Thirty-three remain in the program over a year later. Given the realities of the San Francisco housing market, particularly that portion of it accessible to those of low or moderate income, and especially after the loss of about 1,100 units in the earthquake, it is unlikely that all of those who received temporary housing assistance have found suitable permanent housing. Many were not adequately informed that this is a federal responsibility; some have become frustrated in dealing with a distant, complex bureaucracy; some have left the area, have settled for inadequate housing, or become homeless. Some have turned to the City for assistance, which is the usual provider of aid for the poor.

Because of the complexity of the programs and the variety of federal agencies involved, and because of their relatively short-term commitment to the victims and to the areas, there was no follow-up by those agencies to determine whether those in need of assistance actually received the assistance they needed. A locally run program to match victims with resources, perhaps using a caseworkers approach, in which each disaster victim needs to deal with one government contact rather than several, could be more effective and efficient than the current complex and distant system.

PUBLIC ASSISTANCE PROGRAM

Public facilities in San Francisco were also damaged by the earthquake. The City estimates the costs to repair damaged City facilities at about $130 million, including about $60 million damage to public buildings, $19 million damage to port facilities, $15 million damage to airport facilities, and $21 million damage to Unified School District facilities. About $14 million will be needed to repair facilities of nonprofit agencies that qualify for the Public Assistance Program.

The federal Public Assistance Program is intended to provide funding for repairing or replacing facilities of public or qualified nonprofit agencies. Applications for these federal funds are made by local agencies, through the state, to FEMA. Partially as a result of this three-level process, and partially as a result of ambiguous regulations or inflexible application of regulations by federal agencies, this program has required considerable administrative time from City staff, and funds have been slow to reach the local level where necessary expenditures are made. About $30 million (of the $130 million the City believes is appropriate) had been received one year later. As a result, many immediate and mid-term needs have not yet been met and necessary repairs have not been made. To the extent that these repairs will mitigate existing earthquake hazards, delay entails additional risk.

San Francisco has, to a very small extent, bridged this gap by using donations from the public to the City which totaled over $4 million. After a larger disaster than the Loma Prieta

earthquake, or in a less economically resilient area than the Bay Area, or if public donations were not forthcoming, local governments would not be able to fiscally sustain the time and effort required by the Public Assistance Program.

Administration of the federal Public Assistance Program could be considerably simplified by changing the character of the program from one of reimbursement for exhaustively detailed expenses, to one that distributes "block grants" to local agencies. State and federal agencies could establish granting criteria which measure the magnitude of a disaster (which affects the ability of an area to recover) and the estimated damage. Assistance could occur quickly and without a detailed application process. Local governments could establish their own priorities for short-term and long-term recovery assistance and then make a full accounting of expenditures.

HAZARD MITIGATION

The State of California could promote seismic safety in housing in several ways. Existing state and federal programs to assist owners of low-income or multifamily buildings undertaking building code-required repairs such as the federal Rental Rehabilitation Program, the California Housing Rehabilitation Program and the California Rental Rehabilitation Program should be expanded to include voluntary seismic upgrading. These programs generally contain per-unit spending caps and restrict spending to code-required improvements. Publicly subsidized housing rehabilitation projects should, as a matter of policy, encourage or even require funding for seismic safety work, rather than discouraging it. The recent voter-approved statewide bond issue for seismic rehabilitation work is an example of a positive policy toward mitigation. However, it will not be sufficient to meet the needs for seismic retrofitting. Once this bond pool is exhausted, there will again be a disincentive for the acquisition and seismic rehabilitation of residential buildings.

About seventy severely damaged buildings in San Francisco have not been repaired or demolished, and the evidence is that the costs of repair are so large that the owners may abandon the buildings. Recent changes to state law make it easier for the City to institute receivership of damaged abandoned buildings, but such laws do not provide for the necessary construction or take-out financing. Current state law which authorizes court receivership for unreinforced masonry buildings which are not brought up to requirements should be expanded to cover postdisaster abandoned buildings.

An earthquake presents an opportunity for research which could inform future mitigation efforts statewide. San Francisco took advantage of this. For example, the damage and damage patterns of all of the City's unreinforced masonry buildings was investigated after the earthquake. Although it may not have been explicitly intended, OES made this possible by supplying volunteer engineers and inspectors. In future disasters, the state should recognize this opportunity and encourage and publicize such efforts. Rebuilding also presents an important research opportunity. Repaired buildings should be monitored and have instruments installed to measure their response to future earthquakes. Particularly since some rebuilt and repaired buildings use new engineering techniques, important information could be derived from a systematic research effort. This could best be coordinated at the State level as part of the Seismic Motion Instrumentation Program. As part of this effort, the State should conduct detailed debriefings to collect information about how local agencies handled the problems they encountered. This information should then be passed on to others.

SUMMARY

To summarize the issues explored above, we believe that the State should encourage a comprehensive preparedness and response program tailored to local needs. It should include hazard identification, vulnerability

assessments, preparedness and response planning, mitigation planning, and public awareness/education. The State should, in cooperation with local agencies, design programs and systems which could be implemented on the local level. The State program should include guidelines and standards in order to assure that localities are well prepared to carry out their responsibilities.

Life Safety. The State is currently developing a program to assist local governments develop civilian volunteer training. The State should promote the establishment of local citizen volunteer training programs. This could include funding local programs, providing materials, training the local trainers, providing equipment to volunteers, perhaps including a in-situ training session for citizen volunteers by the California Specialized Training Institute. Topics could include fire suppression, first aid, search and rescue, building safety.

The State should facilitate an intraregional system, including local governments and public and private transportation providers, to immediately transport essential personnel to and from predetermined points after a major disaster.

Building Safety. The deficiencies in the ATC-20 system observed in San Francisco should be considered in OES's current evaluation of the ATC-20 program. For example the current procedures lack a category for buildings which do not create a hazard to adjoining structures or to any street or public way, but which are unsafe for occupancy or use, or for buildings which do not present an immediate hazard and can be occupied, but which require repairs.

When outside volunteers are used, each group of volunteers organized by OES should have a "group leader" to provide logistical and organizational support.

Information Management. The State should work with local agencies to develop standard reporting systems, perhaps including standby computers programmed to handle disaster data.

Shelter and Temporary Housing Assistance. A model shelter and temporary housing referral system for earthquake victims should be established. It should be operated by local governmental agencies with the cooperation of local housing and real estate groups.

The State should develop a temporary housing plan and encourage local administration of the Temporary Housing Assistance Program as provided by federal regulations.

Recovery. A program to prepare for local involvement in the postdisaster administration of both the Individual and Family Grant Program and the Public Assistance Program, as well as other recovery activities needs to be established. The State should assist local agencies in determining an effective postdisaster administrative structure. The State should provide an ongoing program of training in the requirements of state and federal programs. Local administration of this program should be part of a comprehensive preparedness and response program tailored to local needs. Part of the State-level program could be the development of standards to be met by local agencies, perhaps including standards for and oversight of local preparedness plans, mitigation programs, and postdisaster administrative structures. Postdisaster funding should be provided as a "block grant" conditioned only on the operation of an effective and efficient overall earthquake preparedness and recovery program.

The State should enact a temporary sales tax increase which could automatically take effect when damage estimates exceed some predetermined level during a declared emergency.

The State should better coordinate the California Natural Disaster Assistance Program and federal assistance. Duplicate damage

inspections should be avoided whenever possible.

Information about local conditions, such as code requirements and building costs, should be incorporated into recovery programs.

The State should provide planning, training, and financial resources for locally run programs to match victims with resources, perhaps using a caseworker approach in which each disaster victim needs to deal with one government contact.

Hazard Mitigation. State and federal housing rehabilitation programs to assist owners of low-income or multifamily buildings undertaking building code-required repairs should be expanded to encourage voluntary seismic upgrading.

Current state law which authorizes court receivership for unreinforced masonry buildings which are not brought up to seismic safety requirements should be expanded to cover postdisaster abandoned buildings.

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City of Santa Cruz[31]

The City of Santa Cruz was relatively well prepared for emergency response to a catastrophic event. However, during the recovery period—which is now continuing into a second year—several unanticipated problems emerged. Planning for different phases of recovery—recognizing that recovery goes on long after the threat to life and property is over and that each phase of recovery has different demands and required responses—could be one of the positive legacies of the Loma Prieta earthquake if actions are taken to encourage pre-event recovery planning.

INITIAL RESPONSE

Several years ago, Santa Cruz adopted the Incident Command System (ICS) as its emergency response mode. An Emergency Operations Center (EOC) had been designated,

31 Submitted by the City of Santa Cruz, Department of Planning and Community Development.

and City personnel had been assigned roles in this system. On October 17, 1989, less than 30 minutes after the earthquake, the EOC was in full operation at Fire Station #2 on the east side of the City.

One reason for this quick response was prior practice. Three years earlier, Santa Cruz had been threatened by a flood on the San Lorenzo River. At that time, the EOC was activated. Critical personnel arrived and put on the orange vests which denote their roles: "Incident Commander," "Public Information Officer," etc. Ultimately, the river did not flood, but City staff had experienced a drill that was colored by the anxiety of a real emergency.

In retrospect, it is very clear that implementing the Incident Command System, assigning responsibility, being physically familiar with the EOC, and practicing the roles which critical personnel would perform, were all extremely important in the City's effective emergency response to the Loma Prieta earthquake. We believe that such drills are a key to success and they should be scheduled on a regular basis.

THE BEGINNING OF TRANSITION

For the first six days after the earthquake, all operations (rescue, security, ingress-egress, etc.) were directed from the EOC at Fire Station #2. By this time, major aftershocks had ceased, the threat to life was no longer critical, and the perimeter of the heavily damaged area had been secured by a chain-link fence. It became clear that a new operations center should be established at the site of the major damage—the Pacific Garden Mall area. Transition had begun from the emergency response phase to the phase of managing recovery.

The City had neither anticipated, nor planned for, such a recovery phase. But the demands, tasks and staffing needs of the situation had changed significantly. With a lot of improvising, the City established "Pac-Ops"—the Pacific Avenue Operations Center. Two office trailers were brought in and located immediately adjacent to the devastated area; this would be the administrative center of recovery activities for the next eight weeks.

As a result of this experience, the City of Santa Cruz has made planning for several phases of recovery part of its emergency response program. The specific profile of calamitous events—fire, flood, earthquake—can never be anticipated. But Loma Prieta demonstrated that in many disasters, the recovery period may extend for weeks, months, or even years. Although most California cities and counties have emergency response programs, few have developed plans for managing recovery. Setting up both general guidelines and some form of administrative structure for this activity can smooth the transition from the emergency response to the initial recovery phase.

PAC-OPS AND BEYOND

The Pacific Garden Mall was—and is—the commercial heart of Santa Cruz. Before the earthquake, 600 businesses operated in the downtown area. After 34 commercial buildings were demolished and an additional 375,000 square feet of commercial space was damaged, 206 businesses had been destroyed or dislocated. In the second week after the earthquake, multiple and unexpected demands emerged. Business people needed to gain access to cash registers and vaults. Lawyers and other professionals needed to retrieve files and other documents. Businesses needed to remove undamaged inventory. Residents needed to retrieve personal belongings. Owners and structural engineers needed to gain access to evaluate damage. Literally hundreds of decisions needed to be made each day. The many constituent groups—residents, businesses, and individuals—had legitimate needs. The paramilitary management style of the emergency response phase was no longer appropriate, nor would it be accepted.

In this postrescue period, a member of the City Planning Department was selected as the Incident Commander for this new phase of

recovery (replacing Public Works/Fire Department personnel). The ICS system was retained in order to have centralized authority and an efficient decision-making mechanism. However, a process of negotiation had begun.

Staff familiar with the ambiguities of policy issues—multiple constituencies and points of view, priorities which are not clear-cut—are probably best suited for managing this phase of recovery. Again, the structure and staffing for carrying out this responsibility should be planned for and articulated. In the wake of Loma Prieta, the City of Santa Cruz had to improvise, and did so fairly successfully—e.g., establishment of Pac-Ops. But the lesson is clear: to prevent chaos—potentially as disastrous as during the emergency response phase—the local government must continue to provide order and control for prolonged periods of time.

RISING LIKE THE PHOENIX

The Loma Prieta earthquake hit just before the Christmas shopping season. Many businesses had invested heavily in merchandise. Recovery for them was contingent on retrieving undamaged inventory and then finding some temporary location in which to operate. Getting the businesses in and out of the devastated area was a logistical challenge. Working with the Chamber of Commerce and the Downtown Association, Pac-Ops orchestrated a safe, orderly and effective inventory retrieval program. The participation of these groups was absolutely necessary to carry out this phase of the recovery effort. The Chamber of Commerce and the Downtown Association had the home phone numbers of business owners and managers. They had the people and the know-how to reach business owners to schedule inventory retrieval and other legitimate trips into the damaged area. They also had the trust of their fellow business people and often knew them personally.

Carrying out this program wasn't easy. Communication was essential. Business people were willing to wait their turn to have access to the area if they knew what the plan was and when they would gain access. Credibility was very important. Under the stress, anxiety and economic pressures of the situation, it was paramount to live up to schedules.

During this Pac-Ops phase of recovery, staffing needs increased significantly. Personnel from City departments who were not involved in the initial EOC period were recruited to carry out the assessment, access, scheduling and other management tasks of this phase. Large numbers of volunteers were utilized to function as guides, monitors and general helpers. Although destruction was concentrated in the downtown commercial area of Santa Cruz, significant numbers of residential units also suffered damage. City employees staffed an outreach program to inform these owners that federal disaster aid was available to them. All of these functions were needed during various stages of recovery. They should be included in emergency response plans.

Within three weeks of the earthquake, temporary tent structures—the Phoenix pavilions—had been erected downtown. These were the spaces displaced businesses could use during the Christmas selling season. City personnel worked with the business community to accomplish this enormous task. Staffing for this activity was critical to the recovery process; such needs should be anticipated in emergency planning.

Based on this experience, it's important to adjust personnel to the tasks that must be accomplished during this phase of recovery. It is critical that the local government understand the point of view of businesses which have been disrupted by a disaster. Operations cannot be carried out in a bureaucratic, "business as usual" fashion; risks must be taken. A flexible system is required that involves the stakeholders in a real way and public/private cooperation is absolutely essential.

LONG-RANGE RECOVERY

Approximately two months after the earthquake, Pac-Ops was reduced in size and moved. By this time, the Mall area was subdivided into those streets and buildings that were open, and those which were secured by fences, pending financial/planning decisions and/or rebuilding. A skeleton crew in one trailer would continue to provide controlled access and supervision of the area for another eight months.

The City Council appointed a 36-member citizen group—*Vision Santa Cruz*—to develop an overall concept for rebuilding the downtown about two months after the earthquake. This process is still continuing. Consultants have been hired to create a downtown/streetscape plan based upon the general principles developed by Vision Santa Cruz. The City Council will adopt a version of this plan and rebuilding of the downtown will enter its final phase.

Since the earthquake, however, the City has approved several projects during the interim recovery period. It was clear that overall planning would take a year or better, and if property owners wanted to begin sooner, they should be encouraged. Thus the City Council adopted an interim policy which allowed owners to rebuild if they submitted projects that were essentially the same size and use as their prequake structures. If they wanted to build something significantly larger or different, they would need to wait for development of the downtown plan.

This approach provided a reasonable amount of flexibility. Ten buildings have been approved under these emergency regulations. At present, only one has been constructed. This illustrates another key aspect of recovery: concentrated properties in a severely damaged area are interdependent.

In Santa Cruz, several major buildings of historic significance have remained in limbo for over a year. Because of cost and engineering factors, some owners wanted to demolish these structures and rebuild. Historic preservationists wanted to save them. In one case, the issue went to court. These buildings were threats to public safety, thus they were surrounded by chain-link fencing. Structures adjacent to them—or within a safety area that was defined if they should fall—were also left in limbo. Basically, several blocks in the downtown remained paralyzed because of the unresolved issues these buildings presented.

This was especially trying for the owners and employees of adjacent structures which could have been repaired were it not for the delay in resolving the status of the historic buildings. This in turn affected the willingness of financial institutions to lend money. Other owners in the downtown were reluctant to blaze the trail and rebuild before all the fences had been removed from the area and full traffic flow was restored to Pacific Avenue.

RECOMMENDATIONS

Based upon these experiences—particularly in the postemergency phases of recovery—the City of Santa Cruz has some recommendations concerning both regulations and delivery of state aid to communities which have suffered major disasters.

The Mayor and City Manager of Santa Cruz, the Redevelopment Director, and the Executive Director of the Chamber of Commerce all testified at a meeting of the Seismic Safety Commission on October 11, 1990. Their testimony highlighted three areas in which regulations and aid packages could be improved.

The first of these concerns historic preservation—specifically Senate Bill (SB) 3X (Marx), legislation that was passed immediately after the earthquake. In her testimony, Mayor Mardi Wormhoudt acknowledged that the bill was an attempt to help, but that its impact has been just the opposite. According to the Mayor, "Unfortunately, it's caused more trouble than you could possibly imagine."

The Mayor was referring to the delays described above: the paralysis caused by debate over specific historic buildings on Pacific

Avenue. The legislative intent of SB 3X is unclear. The City of Santa Cruz recommends that the legislation be amended to define a specific process local jurisdictions must follow before historic buildings may be demolished after a disaster. When such structures present a threat to life and/or a threat to adjacent property, decisions concerning their disposition *must* be left to local government. The process allowing this action must be made very clear so that there is no ambiguity nor cause for legal challenges. The existing path—which the city suffered through under current SB 3X—would cause difficulties to potentially every other city in the state in the event of another major earthquake.

A second area for improvement is redevelopment legislation. The City of Santa Cruz was well served by passage of SB 39X. This bill enabled the City to reconstitute its redevelopment area to develop tax increments after assessed valuations had been reduced drastically because of earthquake damage. Although this legislation allows the City to recapture tax increment revenues to pay for recovery projects, it took eight months for the bill to be processed and signed by the Governor. The City of Santa Cruz recommends that some basic boilerplate redevelopment legislation either be written and ready for adoption in an emergency, or be adopted in a generic sense and ready for modification. Thus other communities facing the same kinds of fiscal recovery for redevelopment projects would be saved approximately six months delay because enabling legislation would already be in place.

The third area for improvement is the concept of emergency relief funding—particularly for earthquake relief. The federal government operates this program through FEMA. The premise of emergency aid is to "replace in kind" what was lost. From an accounting point of view, it is to replace the value of what was lost. In a case such as Santa Cruz, where an earthquake wipes out an entire commercial center (including underground facilities damage), additional aid for reasonable "betterment" needs to be available. This may be a programmatic initiative that California could undertake to fill this gap.

For example, the City of Santa Cruz didn't have a legitimate storm drain system downtown—many patchwork systems had been put together over a period of a hundred years. The City can't rebuild the downtown without installing a new storm drain system all at once. The current emergency funding system will not pick up these betterment costs. The City suggests that some kind of loan program be established by the State and made available to local governments to pay for these kinds of recovery costs. These loans would be repaid to the State, but they would relieve the cash flow difficulties which devastated communities experience in the first months and years after a major earthquake.

SUMMARY

The Incident Command System worked extremely well for the City of Santa Cruz in responding to the Loma Prieta earthquake. Having roles clearly defined, and practicing with the system, helped the City react effectively during the emergency phase of the disaster. However, Loma Prieta demonstrated that planning for subsequent phases of recovery should be part of each local government's emergency response program.

Since no plan can anticipate all that needs to be done in a disaster, it is important to have a flexible and creative response system. Particularly after an earthquake, planning will be an ongoing activity. It must involve the stakeholders in a meaningful way. Public/private sector cooperation is absolutely essential.

During recovery from the Loma Prieta earthquake, Santa Cruz averted political and economic discord by being open and responsive. The City restructured its Incident Command System in midstream and it shared planning and implementation responsibilities with business representatives and volunteers. This approach enabled the City to provide security

and order in the damaged area while orchestrating a planning and recovery program.

All of these activities will be needed to recover from the damage of a major earthquake. Planning for them is the best form of insurance.

County of Santa Cruz[32]

EFFECTIVENESS OF EXISTING LOCAL EARTHQUAKE POLICIES

The effectiveness of local earthquake policies is difficult to measure or to assess accurately. If their effectiveness is based on the degree to which they prevent damage, the answer is "no" they were not effective, since they cannot prevent damage. If the presumption is that they should provide a basis for the mitigation of damage and threat to life and safety, they were probably effective. Structures which sustained damage in the Loma Prieta earthquake were more or less likely to do so based upon one or more of a number of relatively random factors:

- Quality of design
- Quality and extent of engineering
- Quality of materials
- Quality of construction techniques
- Quality of inspection
- Quality of maintenance
- Site-specific soils
- Site-specific and surrounding geology
- The unique characteristics of this particular seismic event and the degree to which they combined with any or all of the previous factors

Clearly, earthquake policies that deal with damage reduction can only be considered as effective as the degree to which they bear on and have the ability to positively affect these factors.

The policies in effect at the time of the Loma Prieta earthquake, including the Geologic Hazards Ordinance (in place since 1982), the building code, and Seismic Safety Element of the General Plan, certainly had a positive effect in limiting the degree of damage in Loma Prieta. While policies underwent revision in response to new information the earthquake exposed about underlying geologic conditions, the County has no doubt that they served an important role in reducing the degree of damage to structures built since their inception.

The ultimate effectiveness of these policies in minimizing damage can be expected to be limited by the effectiveness of public education and awareness. Our policies can only affect a relatively small proportion of properties in the County, even over time.

- The institution of both geologic and earthquake-related policies and codes are relatively recent events with respect to the overall timespan of development and construction in the County.
- Most structures in the County were, therefore, built before the implementation of the development review policies and procedures included in the Geologic Hazards Ordinance, Seismic Safety Element, and their influence upon public awareness.
- Many structures were completed prior to the development and adoption of uniform construction codes.

Currently, seismic retrofitting requirements do not apply to all structures built prior to enaction of the seismic safety portions of construction codes. Given the extent and range of damage experienced in Santa Cruz County to single family dwellings, seismic retrofitting requirements should be extended to this prevalent type of construction in a manner similar to that in place of unreinforced masonry buildings.

Although the data and experience exists to provide the basis of local geologic policies, they can't be considered as universally accurate predictors of damage caused by future earthquakes. The primary utility of local earthquake mitigation policies is in heightened awareness and design for a relative level of risk in general areas; not to predict or prevent damage at specific sites in response to a specific range of events.

[32] Submitted by the County of Santa Cruz Planning Department.

Existing policies enabled Santa Cruz County to respond after the earthquake with relatively few surprising events. The bigger difficulty was the analysis of what had occurred and modification of existing policies in response to new technical information. One major difficulty in that process is that decision-makers and the public prefer absolute answers to questions such as: "Is it safe or not? Will any further damage occur? Will it be damaged again unless I take certain actions now? Will the County stay out of litigation if certain actions are taken now? What's the magnitude of the next big earthquake likely going to be? Why don't we require that people engineer for a 7.0 and call that safe?"

DAMAGE PREVENTION AND REDUCTION

The concept of damage "prevention" is an inappropriate term since prevention isn't practical. Instead, the concept of mitigation for damage reduction should be the standard. Damage reduction through mitigation can be effectively achieved by continuing several activities:

- Education
- Development of earthquake construction techniques and codes
- Extension of seismic retrofitting requirements to structures built before seismic safety codes were enacted
- Identification of areas of high earthquake risk
- Development of policies to mitigate potential damage to facilities located in high risk areas

Consideration of land development policies in areas of higher earthquake risk will inevitably involve stressful debate over the probability of specific hazards. Similarly, debate over issues such as nonconforming rights to rebuild in known high hazard areas will be a recurrent problem. To help local jurisdictions deal effectively with these pressures, it is important for the State to enact legislation which allows local governing bodies to focus on the long term benefits provided by policies which mitigate impacts to the safety, social structure and economic vitality of the community.

The burden of determining acceptable levels of risk currently falls on the local jurisdiction in making land use decisions. Local jurisdictions need more support in their efforts through provision of statutory and financial support to encourage them to create locally applicable mitigation measures. This could include prohibition of rebuilding in areas known to be highly susceptible to failure in significant seismic events and for which engineering based mitigation proves impractical or impossible.

Such resources should also include money for the temporary or permanent relocation of families, businesses, government and other infrastructure in order to minimize the extent of future damage. The County believes that this might prove less costly than extensive demolition, damage repair, legal costs, and loss of economic vitality. Where such relocation methods prove infeasible (such as in the case of infrastructure) the State should provide statutory and financial support to encourage more traditional engineering-based mitigation measures, such as seismic retrofitting. Without such impetus and financial support, it seems unlikely that local jurisdictions can or will take the initiative in these times of limited budgets. If given sufficient tax or other incentives, the public can move to complete mitigation measures on its own, particularly if there was a potential for reduced government support for recovery where available mitigation measures have not been undertaken.

REDUCING TIME AND COMPLEXITY OF COMMUNITY RECOVERY

Local jurisdictions, particularly smaller ones, have insufficient capacity to unilaterally respond to the recovery needs of their community in events with the impact of Loma Prieta. After the initial response period concluded, the enormity of the recovery effort and the degree to which basic, yet critical, policy decisions concerning recovery had not

been previously addressed, led to delays in the community recovery process.

Community recovery plans should be developed to include adopted postearthquake recovery policies that are certified and supported by state and federal agencies for the long term recovery of the community. The plans and policies should address at least the following topics:

- Plans for the utilization of private sector resources within the government response and recovery organization. Santa Cruz County was only able to cope with its repair and reconstruction workload through the use of contacted services. There would have been no effective means of providing expeditious service to the community with the existing County workforce. The County developed the mechanisms to contract for services, such as determining whether the cost of such an undertaking would be eligible for state and federal reimbursement, but initially County staff was still committed entirely to earthquake repair efforts. Nonearthquake permit review essential to economic vitality of the community had to be deferred for three months. Had contracting for staff to perform repair permit review and inspection not been eligible for federal/state reimbursement then the County's recovery would have been unnecessarily delayed and the impact of the earthquake would have extended to those sectors of the community which were otherwise undamaged.
- Specific plans for providing consistency with state or federally mandated hazard mitigation plans;
- Standards for acceptable risk;
- Standards for acceptable alteration of discretionary land use approval processes;
- A state policy outlining and defining the range of local discretion expected to be exercised in recovery and reconstruction land use policy;
- Criteria for the requirement of stricter than normal standards in land use and construction where postearthquake data justifies their implementation;
- Financial regulations for local government budget and accounting procedures should be reviewed pre-earthquake to provide for the expeditious conduct of local government business in the response and recovery phase;

As the manager of the firm which contracted with the County to provide repair and reconstruction permitting services has stated: "Governments should focus on and formalize the process they want to have in place when the disaster strikes rather than trying to reinvent or tweak or get around or ignore normal procedures when you're trying to move as quickly as possible to help your community."

To provide a basis for the effort to balance individual property rights with the mandate to protect public health and safety, local jurisdictions should be required by the State to develop community recovery plans with just as much emphasis, if not more, than is currently placed on immediate emergency response. Recovery is a much more complex endeavor with more dramatic and longer lasting implications than the immediate response. The delays and heavy workload involved with the policy amendment process may have had more of an effect on community recovery than the damage which had already occurred. Written guidance is needed that describes eligible costs for reimbursement. Had such advice been available at the time of the earthquake, some of the confusion, delay, and mistrust could have been avoided.

City of Watsonville[33]

COORDINATION BETWEEN FEDERAL, STATE, AND LOCAL ASSISTANCE AGENCIES

The coordination of services between government and community service agencies is very important. The line of communications

33 Submitted by the City of Watsonville, Office of the City Manager, in cooperation with the Department of Recreation and the Office of the Fire Chief.

must be open from the start of response through to the end of the disaster recovery efforts. In general, improvements can be developed in the disaster management network between federal, state, and local assistance.

The mission, goals and operation guidelines for state and federal disaster response agencies should be reassessed to reflect the true nature and extent of damages caused by large earthquakes. Response agencies should adapt to the "real world" when managing a disaster that touches every part of our service delivery system.

An updated mission and goals statement for disaster response agencies should be promoted. Employees, political leaders, local officials, and the general public should be informed of the roles of the various disaster response agencies. Their services should be directed at recovering from the loss of basic life and health safety, with safe housing, food and water being the highest priorities.

Most of the problems associated with caring for disaster victims are reflective of ongoing concerns. Existing problems with housing and other basic survival needs are magnified many times after an earthquake. The general public demands support from all levels of government to help provide for those needs. Poor *multicultural awareness* was a source of many problems associated with the disaster in Watsonville.

The following is Watsonville's assessment of federal, state and local response. Based on the earthquake experience, we have attempted the identify better methods of response for the future.

FEMA RESPONSE

Many single-family residences that were destroyed or severely damaged by the earthquake had several families living in them. Those with rental receipts received support. The other household members (those without rent documentation) were left homeless and without their own financial support. This policy needs to be adapted for multifamily residents.

Local housing costs and availability dictate the amount of support necessary from FEMA. Many Watsonville citizens are still struggling to find a home (15 months after the earthquake). FEMA housing support guidelines need to adapt to local conditions.

Earthquake victims should be treated less bureaucratically and more realistically. The paperwork needs to be reduced and simplified (6th grade level). All information needs to be available in Spanish and other languages, as appropriate.

Many people received financial assistance without understanding the implications. Many people saved the funds and stayed in tents, unsure of what next step to take. Other people bought some nonessential items such as a car, not realizing that the check was the last of the FEMA aid. A clear understanding of future rights and benefits should be explained before a family accepts the one-time payment.

Duplicated effort and confusion could be substantially reduced if FEMA representatives worked closer with outreach groups such as the local housing agencies, community action board, Red Cross, Salud Para la Gente, and other community service groups. Local housing service groups can find housing that is suitable for families located closer to their work than where FEMA located housing. The local outreach workers know many of the victims and can provide a good case history to work from.

Many FEMA workers were not familiar with the current federal regulations and guidelines. They gave misleading and contradictory information. A FEMA outreach worker pocket manual should be developed to help FEMA workers present clear and consistent messages. Bilingual and "culturally sensitive" volunteers and staff are needed and they need appropriate training.

FEMA should develop a public information handbook and a series of public service announcements that indicate the services they provide. A radio talk show with FEMA, Red

Cross, and local disaster service groups provided very valuable public information.

The FEMA reimbursement rates for housing assistance and repair costs need to be adapted to the local economy. The rates used were far below the local costs of housing and building repair.

Residents of temporary FEMA housing (mobile homes) should be dealt with in a more practical fashion. Each family should be worked with individually to find new homes. A cooperative relationship with local housing assistance groups will help in finding housing solutions. The long-term housing solutions require more local involvement with FEMA service workers. FEMA seemed to distance themselves from City and County housing groups.

The FEMA policy on demolition of earthquake-damaged property needs to be updated and clarified. The final decision of whether the cost of demolishing earthquake-damaged housing would be reimbursed wasn't made until late in the recovery effort; some are not made yet, over a year after the earthquake. There were many debates on covering cost of earthquake damages on some commercial structures. A FEMA policy on demolition expense coverage for vacant buildings that were already in disrepair prior to the earthquake is also needed.

The assessment of damages to housing was poorly coordinated between FEMA and local inspectors. The City had inspections performed by professional building inspectors and structural engineers. FEMA duplicated this service with their own inspectors. Many times the damage assessments were different. The logic for the posting had to be debated between the owner and the inspector in the field. FEMA should initiate early dialog with planning and building officials from locally impacted areas. FEMA inspectors and local inspectors should operate as a team coordinated under a joint command system. This system would prevent occupants and owners from getting mixed messages between local inspectors and FEMA inspectors.

Many logistical problems could have been dealt with earlier if the local, state, and federal agencies had been meeting and planning together. For example, the disaster assistance center (DAC) was located on the outskirts of the City. Transportation to the center was poor. The City had to organize a special transportation network from the Red Cross shelters to the center.

After three months of operating the emergency shelters, Red Cross and local disaster service agencies were ready to close. The coordination between the City and County service agencies accepting responsibility for the victims was critical. This exchange required a good deal of outreach work with disaster victims located at the shelters. The Red Cross, County, and City outreach workers teamed together to provide the information and support to the shelter residents. For the most part, FEMA operated on its own. The effort would have worked much better if all groups would have approached the problem together. The local outreach workers could have used their experience to deal with the special cases, i.e., known drug addicts, perpetual homeless, as well as developmentally disabled. Local outreach workers are also familiar with the services and housing stock available for long term solutions which are most likely to be cost effective.

STATE RESPONSE

The ability to plan and establish a coordinated command structure is a common theme to our concern about better services between state, federal, and local response agencies. More planning and ongoing training is vital to this cause. An established planning and decision-making process should be developed. Strong ties need to be developed between the local service groups and state and federal agencies. The gaps between service groups need to narrow and the duplication of effort and the conveyance of mixed messages need to be eliminated.

There is a lot of similarity between the state and federal response issues. The suggestions just presented in the FEMA section are applicable to state response agencies as well. The following are additional recommendations that apply to the State response.

The initial situation status report developed by the State OES was vague. Watsonville was left with an impression that the San Francisco Bay Area was heavily impacted by the earthquake because our only source of damage information was the media reports. Consequently, Watsonville's requests for assistance were parred down because the State did not communicate an accurate early assessment of damages or provide an early indication of what to expect in the aftermath of the earthquake. Local jurisdictions affected by the initial shock of a major quake should receive a status check communication early in the disaster initiated by State OES. Predicted aftershocks, major transportation blocks and other critical response information should be communicated early in the incident.

Local agencies *must* learn the mutual aid system and use it appropriately. Nevertheless, some response agencies could be more flexible. The National Guard should be the first to be evaluated. The upper echelon has a "last-in, first-out" mentality. In one case (one month into the response), Watsonville was required to attain a mission number (which took most of the day) simply to get a National Guard truck to be used to move a load of plywood from the Santa Cruz County Fairgrounds to Ramsay Park (about 6 miles).

There is now a wonderful opportunity to learn from the experiences that occurred after the Loma Prieta earthquake. The California State Training Institute (CSTI) should meet with local staff to discuss these experiences. These insights could improve their earthquake procedures training system (for which Watsonville has been a big supporter!).

The Hazard Mitigation Grant Program process is an excellent opportunity to build a stronger defense against to the next disaster, although the process for attaining 50 percent grant funding is underfunded and overburdened with paperwork. The entire process requires hours of research and report-writing. This occurs at a time when recovery activities are still occurring! The timeframes for grant processing are *very* short. The request for support data, resolutions and environmental impact reports on all proposals does not seem valid, especially in light of the limited funding and limitations on the types of projects for which grant funding is allowed.

The State should initiate more planning on potential problems associated with earthquakes. Predesignated threat scenarios should be developed. State and local response agencies could plan a response to the threat scenarios. Perhaps the top five expected earthquake impact zones in California should be targeted for planning first.

LOCAL RESPONSE

Preparedness Overview. The Loma Prieta earthquake experience left us with a vivid understanding of key preparedness measures for the next "big one." The following is a summary of those insights.

We should evaluate our communities and target the hazard areas, paying close attention to liquefaction areas. Parapets, carports, balconies and other overhanging structures are vulnerable to collapse. Systems containing hazardous gases, such as ammonia refrigeration systems and chlorine water treatment systems, need to be seismicly braced. Underground utilities and bridges located in liquefaction areas need to be flagged as immediate suspects for damage.

Early in the disaster, the National Guard was very cooperative. As time went on, the commanding officers became more bureaucratic. After the first three weeks they made it clear that they wanted to pull out.

There is no doubt about the instability of unreinforced masonry construction, especially when located in areas where poor soils exist or liquefaction could occur. We should target those areas for heavy rescue, medical treatment and increased fire potential.

Finally, we should expect increased fire activity in the mobile home parks. In Watsonville, five out of the six structural fires that immediately followed the Loma Prieta earthquake occurred in mobile homes. It is expected that the location of the natural gas supply lines are too close to the electrical supply. Leaking natural gas appeared to be easy to ignite in mobile homes.

The earthquake caused many homes that were not properly secured to a stable foundation to move off of their foundations. In many cases, the homes moved several feet. The dangers of the movement were substantially increased when natural gas meters were sheared off with the movement of the buildings. Obviously, an aggressive effort to tie homes to permanent foundations that are seismicly sound is urgently required.

Emergency Response. Based on this experience, Watsonville has recognized the need for planned response. There are definite activities necessary to adapt to the conditions resulting from an earthquake. The following is a review of those concerns.

Prepare all facilities for the shock of a large earthquake. Seismic bracing is vital for emergency generators, fuel systems, communications facilities, self contained breathing apparatus air filling stations, water heaters, and all other critically needed resources or dangerous building contents.

All personnel should have a clear understanding of the earthquake response procedures. Priority should first be placed on personal and family survival. Predesignated response procedures for on-duty, off-duty and family members are vital.

The incident command system is a very effective management tool for handling any disaster. We recommend that each fire station be designated as a division with a division commander in charge. The logistics, finance, and operation staffs should coordinate with the jurisdiction emergency operations center. A water-supply officer should be established early if fire circumstances exist.

Situation status reports are a high priority, especially early in the disaster. We need a *reliable* method of assessing emergency circumstances immediately. We recommend the police as a lead agency in attaining information relating to the disaster. After attaining the situation status, responses to fires, hazardous materials, emergency medical and rescue demands can be planned. Meanwhile, we must respond to the most life-threatening circumstance first, e.g., a threatening fire would have higher priority than a rescue from a collapsed building.

Regional planning is vital. We recommend that small geographical areas within a county organize for team response. A regional coordinator for the county, i.e., South Santa Cruz County, can work full time on assessing situation status and emergency response needs. The regional coordinator can help the local fire chief attain needed resources. We should plan for double the number of resources known immediately to be needed and then request such services through the mutual aid network.

Coordination with public utilities is vital. Small fire service response teams can evaluate building collapse scenes and determine resources needed. Many times, firefighters can stop low-pressure natural gas service leaks by simply driving a redwood plug into the gas lines. Communication ties need to be developed early between utility service crews and the fire operations chief. They need to work on the large releases before responding to the smaller house service calls.

Provision of vital support services needs to be planned. A local plan for coordinating and managing needed fuel, water, emergency power, communications, and feeding needs to be developed. This logistical challenge needs to be developed through the joint efforts of community groups and local government.

Community Response. There are more resources available in our communities than most of us realize. People tend to team together and respond to community needs effectively, especially if coordination and communication

efforts are made. Based on the experience of this earthquake, Watsonville is currently working to improve the emergency response network. The following is a summary of these activities.

Watsonville is developing emergency response agreements between all community response groups. These groups include City and County OES, medical clinics, school systems, utilities (gas, electric, telephone), emergency shelters, Red Cross, Salvation Army, Food Bank, religious groups, amateur radio, news media, Chamber of Commerce, and other community response agencies who need to develop a working relationship. We recommend that the mission of each response group be developed and charted for group review. Once a dialogue begins, many groups will surface and fill the response voids that the response group identifies. This community response group needs to include representatives who reflect the socioeconomic and cultural makeup of the community so that a variety of service needs are planned for.

A response network for medical care, shelter, food supply, health care and resource allocation is also being developed. The communications needs, command structure, and service requirements (supplies, warehouses, etc.) should be part of a written plan to be approved by all involved.

The community response team needs training. Watsonville is planning a town meeting to replay the Loma Prieta earthquake. Key response players will sit on a panel to discuss how they will respond. The goal of this training event is to find weaknesses in the planning. The training event is highly publicized to encourage community involvement and feedback. Follow-up training will then be scheduled. Community preparedness will also help Watsonville staff respond to day-to-day needs more effectively. The team relationship has already improved the community's overall relations.

Development of a command structure within the neighborhoods and training at that level is vital to effective community recovery. The leadership can serve as a quick method of attaining accurate assessments of emergency response and long-term recovery needs. Obviously, communication and training are necessary for the system to function properly. The ongoing relationship between community groups needs to be supported by local government. The specific weaknesses in the response system need to be targeted and planned out. The team needs to attain positive results and train on the system periodically.

Recovery Demands. There are many challenges for communities recovering from a major disaster. The logistical, financial and public information requirements are tremendous. We must develop systems that allow communities to bounce back quickly. For that reason, Watsonville makes the following recommendations.

Adopt the incident command system and extend its use and its roles to include the recovery period. This system has proven to be an improvement over past models for managing disaster operations. Responsibility is spread in a command format that covers all response challenges. The system allows for decentralization of the emergency operations center. The EOC is used as a command post where the response plan is implemented and situation status is maintained. Only the disaster command staff (Emergency Services Director and lead emergency response team) need to be present in the EOC. Support staff and branch leaders can develop their operations at field positions. The entire response team leadership should meet on a scheduled basis to update the response plan.

The recovery response team also needs training. Watsonville recommends that OES develop courses in *finance, plans,* and *logistics* to reflect the actual demands of the recovery period, including FEMA and OES rules and regulations. For example, the allocation of donated food and clothing (storage and distribution) is a tremendous challenge that is overlooked in our current training plan.

The damage assessment process can be highly controversial and very difficult to manage. A

system for accurately posting damaged buildings is needed (in all appropriate languages). The system should be universally adopted and qualified persons must be trained in its use. Out-of-town inspectors and structural engineers should be aware of the inspection and posting procedures. The forms should be easy to use and structured in a fashion to be compatible with computer data management systems.

Demolition and access procedures should be developed to inform building owners and tenants of their options. Procedures for obtaining inventories and personal belongings from damaged buildings need to be developed. The City emergency services director, City Attorney, State OES, and FEMA representatives need to understand their obligation to develop processes that consider the public's needs. The local coordination between the business community and government after a disaster is essential, especially when considering the need for good relations during disaster recovery.

Building repairs for "yellow-tagged" buildings is a logistical and management nightmare. The coordination between code enforcement officials, utilities, volunteer repair groups, and building owners and tenants is very difficult. Written reconstruction process procedures and streamlined permit processes are necessary. The "yellow-tagged" buildings need to be repaired quickly. The code requirements need to be adapted to practically address safe earthquake repairs that do not constitute new construction or major remodel. A coordinated effort between the local jurisdiction and church groups, trade associations, unions, and other reconstruction support groups is necessary.

Public information and rumor control are vitally necessary after a disaster. Predisaster relations between the emergency broadcast system staff and personnel that will staff the EOC should be cultivated. The most advanced computer, fax, and communications networks need to be utilized for public information officials. The public information officer (PIO) needs a team to perform that command function. The PIO plan should include information exchange between media, the response team, and the community as a whole.

The management of donated resources requires coordination locally, statewide, nationally, and internationally. Many tons of resources arrive in a community struck by disaster. Much of what is donated is not needed. A system for communicating the actual needed resources and for warehousing and distributing them is also needed. For example, the League of California Cities has a computer link between most cities in California. That network (Citylink) could be used to communicate specific requests. The supplies arriving at local airports and local jurisdictions should be funnelled to appropriate warehouse facilities. Community groups in conjunction with state support personnel should be ready to manage the resources.

A better understanding of how political leaders best fit into disaster operations is needed. They are the elected leaders that should play a key role in recovery from a disaster. Accurate and timely communications and coordination between disaster managers and the political leaders are critical to a smooth process. The timing and local security demands for political visits should also be evaluated. The opportunity for visual review of disaster circumstances is needed, but *without* interruption of emergency rescue or other life safety response actions.

Shelter Services. City departments charged with the responsibility of care and shelter should establish protocols with the Red Cross to formalize a working relationship in setting up shelters.

The Red Cross and the City can predetermine shelter sites with Organizational Agreements and Mass Care Facility Surveys (Red Cross forms).

Governmental departments responsible for building inspection must develop protocols on a priority system to facilitate the establishment of shelters. "Safe for Occupancy" signs should be posted prominently to advise shelterees that an inspection has occurred and that they are safe—

an important psychological element after earthquakes!

City personnel should be trained by the Red Cross in disaster services to facilitate the *opening* of shelters until such time as sufficient Red Cross volunteers arrive. Should the need develop for City employees to continue to act as shelter managers, mutual aid from other cities should be contracted.

In Watsonville, Parks and Recreation Department personnel were particularly suited for shelter duty as these people are known in local neighborhoods and have established rapport and credibility. They also serve as role models for children. Watsonville Recreation Department personnel spent hours and days assisting earthquake victims and encouraging them to go to shelters rather than stay in make-shift tents without sanitation, etc.

Cities having significant minority populations must actively solicit those minorities to become involved as Red Cross shelter volunteers, or on site or disaster planning committees.

Cities should meet quarterly with human service agencies that play roles in disaster services management, including but not limited to the Red Cross, food banks, health clinics, county health departments, and utility companies to share information on disaster response and coordination.

"Unofficial" tent shelters are at best a headache—at worst a nightmare. The Callaghan Park "tent city" became a focal point of political protest, a media focus and the distribution point for dumped, donated commodities. Encouraged by leaders who felt minority groups were left out of the disaster service process, private tents were set up at Callaghan Park. This lack of inclusion was indeed a serious, ignorant omission from Watsonville's planning process! In-situ leadership evolved as services were demanded by victims. Media attention fueled the demands and encouraged entrenchment rather than relocation to Red Cross shelters. Victims insisted that they be allowed to remain near their homes, mostly rental units, to protect their possessions and be close to their children's schools should another earthquake occur. The public responded to media releases and literally dumped tons of clothing at the park and brought prepared foods, some of which spoiled without adequate refrigeration. Conditions became a major concern to public health and safety officials.

In retrospect, a number of planning protocols and policies could have prevented the Callaghan Park incident. Local Red Cross organizations must be aware of cultural and ethnic diversity and study disasters in other countries. Santa Cruz County Red Cross officials were not aware of the preference for use of tents so they were reluctant to set up tents early on in the disaster. Strategic placement of shelters at schools and other sites central to neighborhood areas may have prevented the ad hoc shelter and the poor conditions that followed.

Plan for the sorting, storage and distribution of donated clothing and household items for earthquake victims. Limited occupancy buildings may have a use for warehousing supplies. Should another disaster occur in Watsonville, Callaghan Park will serve as a focal point for information, medical first aid, water and food distribution under the auspices of the City, Red Cross, a local health clinic, and other social service agencies. Tents, if they need to be erected, will be designated as under Red Cross shelter services operations. Public service announcements will direct those with donations to receiving and distribution locations operated by local community service groups.

The importance of local disaster service providers meeting regularly cannot be overstated. It is vitally important that these groups meet, develop key contacts, identify each agency's mission in the provision of disaster services, and develop methods to identify and coordinate key services. Groups representing minority and special needs populations are essential to the disaster planning process.

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