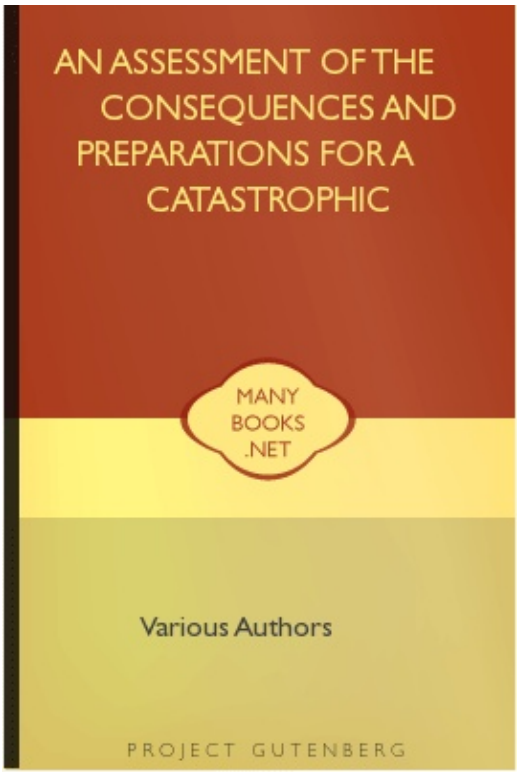

An Assessment of the Consequences and Preparations for a Catastrophic California Earthquake: Findings and Actions Taken

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+--+ | Transcriber's Note: | | | | In this document, *italics* are represented as underscores, | | =bold text= is marked with equals signs, and bullets are | | represented as » | | | | One of the tables in this document is very wide (80 characters) | | | +--+

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AN ASSESSMENT OF THE CONSEQUENCES AND PREPARATIONS FOR A CATASTROPHIC CALIFORNIA EARTHQUAKE: FINDINGS AND ACTIONS TAKEN

PREPARED BY FEDERAL EMERGENCY MANAGEMENT AGENCY FROM ANALYSES CARRIED OUT BY THE NATIONAL SECURITY COUNCIL ad hoc COMMITTEE ON ASSESSMENT OF CONSEQUENCES AND PREPARATIONS FOR A MAJOR CALIFORNIA EARTHQUAKE

[Illustration: fema symbol federal emergency management agency]

Washington, D.C. 20472 November 1980

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CHAPTER I

EXECUTIVE SUMMARY OF FINDINGS, ISSUES, AND ACTIONS

A. BACKGROUND

After viewing the destruction wrought by the eruption of Mt. St. Helens in Washington State in May 1980, President Carter became concerned about the impacts of a similar event of low probability but high damage potential, namely a catastrophic earthquake in California, and the state of readiness to cope with the impacts of such an event.

As a result of the President's concern, an *ad hoc* committee of the National Security Council was formed to conduct a government review of the consequences of, and preparation for such an event. In addition to the Federal Emergency Management Agency, the Committee included representatives from the Office of Science and Technology Policy, the United States Geological Survey of the Department of the Interior, the Department of Defense, the Department of Transportation, and the National Communications System, at the Federal level; State of California agencies and California local governments at the State and local levels; and consultants from the private sector. During the summer of 1980, the participants in this review prepared working papers on relevant issues and problem areas for the consideration of the *ad hoc* committee. Pertinent facts, conclusions and recommendations were reviewed with the Governor of the State of California. The President reviewed the *ad hoc* committee's findings and approved the recommendations for Federal action. This report summarizes the results of the assessment and notes these actions.

A number of Federal legislative and administrative actions have been taken to bring about, in the near future, an increased capability to respond to such an event. The Earthquake Hazards Reduction Act of 1977 (P.L. 95-124) authorizes a coordinated and structured program to identify earthquake risks and prepare to lessen or mitigate their impacts by a variety of means. The coordination of this program, the National Earthquake Hazards Reduction Program (NEHRP), is the responsibility of the Federal Emergency Management Agency (FEMA), which is charged with focusing Federal efforts to respond to emergencies of all types and lessen their impacts before they occur. The NEHRP has six high-priority thrusts:

» Overall coordination of Federal departments and agencies' programs

» Maintenance of a comprehensive program of research and development for earthquake prediction and hazards mitigation

» Leadership and support of the Federal Interagency Committee on Seismic Safety in Construction as it develops seismic design and construction standards for use in Federal projects

» Development of response plans and assistance to State and local governments in the preparation of their plans

» Analysis of the ability of financial institutions to perform their functions after a creditable prediction of an earthquake as well as after an event, together with an exploration of the feasibility of using these institutions to foster hazard reduction

» An examination of the appropriate role of insurance in mitigating the impacts of earthquakes.

More recently, a cooperative Federal, State, local, and private-sector effort was initiated to prepare for responding to a credible large-magnitude earthquake, or its prediction, in Southern California.

B. SUMMARY

The review provided the overall assessment that the Nation is essentially unprepared for the catastrophic earthquake (with a probability greater than 50 percent) that must be expected in California in the next three decades. While current response plans and preparedness measures may be adequate for moderate earthquakes, Federal, State, and local officials agree that preparations are woefully inadequate to cope with the damage and casualties from a catastrophic earthquake, and with the disruptions in communications, social fabric, and governmental structure that may follow. Because of the large concentration of population and industry, the impacts of such an earthquake would surpass those of any natural disaster thus far experienced by the Nation. Indeed, the United States has not suffered any disaster of this magnitude on its own territory since the Civil War.

The basis for this overall assessment is summarized below and discussed in more detail in the subsequent chapters of this report.

C. LIKELIHOOD OF FUTURE EARTHQUAKES

Earth scientists unanimously agree on the inevitability of major earthquakes in California. The gradual movement of the Pacific Plate relative to the North American Plate leads to the inexorable concentration of strain along the San Andreas and related fault systems. While some of this strain is released by moderate and smaller earthquakes and by slippage without earthquakes, geologic studies indicate that the vast bulk of the strain is released through the occurrence of major earthquakes--that is, earthquakes with Richter magnitudes of 7.0 and larger and capable of widespread damage in a developed region. Along the Southern San Andreas fault, some 30 miles from Los Angeles, for example, geologists can demonstrate that at least eight major earthquakes have occurred in the past 1,200 years with an average spacing in time of 140 years, plus or minus 30 years. The last such event occurred in 1857. Based on these statistics and other geophysical observations, geologists estimate that the probability for the recurrence of a similar earthquake is currently as large as 2 to 5 percent per year and greater than 50 percent in the next 30 years. Geologic evidence also indicates other faults capable of generating major earthquakes in other locations near urban centers in California, including San Francisco-Oakland, the immediate Los Angeles region, and San Diego. Seven potential events have been postulated for purposes of this review and are discussed in chapter II. The current estimated probability for a major earthquake in these other locations is smaller, but significant. The aggregate probability for a catastrophic earthquake in the whole of California in the next three decades is well in excess of 50 percent.

D. CASUALTIES AND PROPERTY DAMAGE

Casualties and property damage estimates for four of the most likely catastrophic earthquakes in California were prepared to form a basis for emergency preparedness and response. Chapter III gives details on these estimates. Deaths and injuries would occur principally because of the failure of man-made structures, particularly older, multistory, and unreinforced brick masonry buildings built before the adoption of earthquake-resistant building codes. Experience has shown that some modern multistory buildings--constructed as recently as the late 1960's but not adequately designed or erected to meet the current understanding of requirements for seismic resistance--are also subject to failure. Strong ground shaking, which is the primary cause of damage during earthquakes, often extends over vast areas. For example, in an earthquake similar to that which occurred in 1857, strong ground shaking (above the threshold for causing damage) would extend in a broad strip along the Southern San Andreas fault, about 250 miles long and 100 miles wide, and include almost all of the Los Angeles-San Bernardino metropolitan area, and all of Ventura, Santa Barbara, San Luis Obispo, and Kern counties.

For the most probable catastrophic earthquake--a Richter magnitude 8+ earthquake similar to that of 1857, which occurred along the Southern San Andreas fault--estimates of fatalities range from about 3,000, if the earthquake were to occur at 2:30 a.m. when the population is relatively safe at home, to more than 13,000, if the earthquake were to occur at 4:30 p.m. on a weekday, when much of the population is either in office buildings or on the streets. Injuries serious enough to require hospitalization under normal circumstances are

estimated to be about four times as great as fatalities. For the less likely prospect of a Richter magnitude 7.5 earthquake on the Newport-Inglewood fault in the immediate Los Angeles area, fatalities are estimated to be about 4,000 to 23,000, at the same respective times. Such an earthquake, despite its smaller magnitude, would be more destructive because of its relative proximity to the most heavily developed regions; however, the probability of this event is estimated to be only about 0.1 percent per year. Smaller magnitude--and consequently less damaging--earthquakes are anticipated with greater frequency on a number of fault systems in California.

In either of these earthquakes, casualties could surpass the previous single greatest loss of life in the United States due to a natural disaster, which was about 6,000 persons killed when a hurricane and storm surge struck the Galveston area of the Texas coast in 1900. The highest loss of life due to earthquakes in the United States occurred in San Francisco in 1906, when 700 people were killed. By way of comparison (in spite of the vast differences in building design and practices and socioeconomic systems) the devastating 1976 Tangshan earthquake in China caused fatalities ranging from the official Chinese Government figure of 242,000 to unofficial estimates as high as 700,000. Fortunately, building practices in the United States preclude such a massive loss of life.

Property losses are expected to be higher than in any past earthquake in the United States. For example, San Francisco in 1906, and Anchorage in 1964, were both much less developed than today when they were hit by earthquakes. And the San Fernando earthquake in 1971, was only a moderate shock that struck on the fringe of a large urban area. Each of these three earthquakes caused damage estimated at about $0.5 billion in the then current dollars. Estimates of property damage for the most probable catastrophic earthquake on the Southern San Andreas (Richter magnitude 8+) and for the less probable but more damaging one (Richter magnitude 7.5) on the Newport-Inglewood fault, are about $15 billion and $70 billion respectively. By comparison, tropical storm Agnes caused the largest economic loss due to a natural disaster in the United States to date but it amounted to only $3.5 billion (in 1972 dollars).

It should be noted, however, that substantial uncertainty exists in casualty and property damage estimates because they are based on experience with only moderate earthquakes in the United States (such as the 1971 San Fernando earthquake) and experience in other countries where buildings are generally less resistant to damage. The uncertainty is so large that the estimated impacts could be off by a factor of two or three, either too high or too low. Even if these lowest estimates prevail, however, the assessment about preparedness and the capability to respond to the disasters discussed in this report would be substantially unchanged.

Assuming a catastrophic earthquake, a variety of secondary problems could also be expected. Search and rescue operations--requiring heavy equipment to move debris--would be needed to free people trapped in collapsed buildings. It is likely that injuries, particularly those immediately after the event, could overwhelm medical capabilities, necessitating a system of allocating medical resources to those who could be helped the most. Numerous local fires must be expected; nevertheless, a conflagration such as that which followed the Tokyo earthquake of 1923, or the San Francisco earthquake of 1906, is improbable, unless a "Santa Ana type" wind pattern is in effect. Since the near failure of a dam in the San Fernando, California, earthquake of 1971 (which was a moderate event), substantial progress has been made in California to reduce the hazard from dams, in some cases through reconstruction. For planning purposes, however, experts believe that the failure of at least one dam should be anticipated during a catastrophic earthquake in either the Los Angeles or San Francisco regions.

Experience in past earthquakes, particularly the 1971 San Fernando earthquake, has demonstrated the potential vulnerability of commercial telephone service to earthquakes, including the possibility of damage to switching facilities from ground shaking and rupture of underground cables that cross faults. This is especially serious because immediately following earthquakes, public demand for telephone services increases drastically. This increased demand overloads the capability of the system, even if it had not been damaged, and therefore management action to reduce the availability of service to non-priority users and to

accommodate emergency calls is mandatory. Radio-based communication systems, particularly those not requiring commercial power, are relatively safe from damage, although some must be anticipated. The redundancy of existing communication systems, including those designed for emergency use, means that some capability for communicating with the affected region from the outside would almost surely exist. Restoration of service by the commercial carriers should begin within 24 to 72 hours as a result of maintenance and management actions; however, total restoration of service would take significantly longer.

While numerous agencies have the capability for emergency communication within themselves, non-telephonic communication among entities and agencies in the affected area is minimal. This is true for Federal, State, and local agencies. This weakness has been pointed out repeatedly by earthquake response exercises, and the problem is raised by almost every emergency preparedness official at every level of government. Consequently, a major problem for resolution is the operational integration of communications systems and networks among the relevant Federal, State, and local agencies.

Because of their network-like character, most systems for transportation and water and power generation and distribution, as a whole, are resistant to failure, despite potentially severe local damage. These systems would suffer serious local outages, particularly in the first several days after the event, but would resume service over a few weeks to months. The principal difficulty would be the greatly increased need for these systems in the first few days after the event, when lifesaving activities would be paramount.

Portions of the San Francisco Bay Area and of the Los Angeles Area contain substantial concentrations of manufacturing capacity for guided missiles and space vehicles, semiconductors, aircraft parts, electronic computing equipment, and airframes. Their specific vulnerability to the postulated earthquakes was not analyzed. In the event of major damage, however, the long-term impacts may be mitigated somewhat by such measures as the use of underutilized capacity located elsewhere, substitution of capacity from other industries, imports, use of other products, and drawing-down of inventories.

Since we have not recently experienced a catastrophic earthquake in the United States, there are many unknowns which must be estimated with best judgment. This is true particularly for the response of individuals as well as governmental and other institutions. Popular assumptions of post-disaster behavior include antisocial behavior and the need for martial law, the breakdown of government institutions, and the requirement for the quick assertion of outside leadership and control. Practical experience and field studies of disasters, however, indicate that these assumptions are not necessarily correct. On the contrary, the impacts of the disaster commonly produce a sense of solidarity and cooperativeness among the survivors. Nonetheless, the perception remains among emergency response officials that there will be an increased need for law enforcement following the event.

Another major unknown involves whether a medium or short-term warning of the event would be possible and how such a warning could be utilized most effectively. The technology for earthquake prediction is in an early stage of development and, therefore it is problematical that researchers will succeed in issuing a short-term warning before a catastrophic earthquake, should the event occur in the next few years. Yet as research progresses, scientifically-based, intermediate-term warnings are possible, but subject to a high degree of uncertainty. Consequently, response preparations must be made for both an earthquake without warning, and one with a short-or intermediate-term warning, possibly with a significant level of uncertainty.

E. CAPABILITY FOR RESPONSE

Planning for response to a large-scale disaster is a complicated process encompassing many variables such as population densities and distribution characteristics; land-use patterns and construction techniques; geographical configurations; vulnerability of transportation; communications and other lifeline systems; complex response operations; long-term physical, social, and economic recovery policies. These factors, together with the realization that an earthquake has the potential for being the greatest single-event

catastrophe in California, make it incumbent upon the State to maintain as high a level of emergency readiness as is practicable, and to provide guidance and assistance to local jurisdictions desiring to plan and prepare for such events. Annex 2 reviews the general nature of preparedness planning and the basic characteristics of California and Federal Government plans.

Federal, State, and local emergency response capabilities are judged to be adequate for moderate earthquakes--those that are most likely to occur frequently in California and cause property damage in the range of $1 billion. Such an event, however, would severely tax existing resources and provide a major test of management relationships among different governmental levels. Federal, State, and local officials, however, are quick to point out serious shortcomings in their ability to respond to a catastrophic earthquake. An analysis of the preparedness posture of 60 local governments, 34 California State organizations, and 17 Federal agencies, carried out by the California Office of Emergency Services (OES) and FEMA, indicates that response to such an earthquake would become disorganized and largely ineffective. Many governmental units have generalized earthquake response plans, some have tailored earthquake plans, and several plans are regularly exercised. The coordination of these plans among jurisdictions, agencies, and levels of government, however, is inadequate. In addition, the potential for prediction is not incorporated; long-term recovery issues are not considered; and communications problems are significant, as discussed above. Overall, Federal preparedness is deficient at this time. Early reaction to a catastrophic event would likely be characterized by delays, ineffective response, and ineffectively coordinated delivery of support.

FEMA Region IX (San Francisco) has drafted an Earthquake Response Plan for the San Francisco Bay area. Annex 2 gives an overview of this draft plan. This is a site-specific plan for response to potential catastrophic earthquake occurrences. The emergency response portion relies upon a decentralized approach which provides for Federal disaster support activities to be assigned to selected Federal agencies by mission assignment letters. No specific plans have been prepared in this detail for other seismic risk areas, although it is expected that the Bay Area plan could be easily adapted to other areas. The Department of Defense and the Department of Transportation are developing detailed earthquake plans that would ensure a well-organized and adequate response to mission assignments for a major earthquake. The plans of other agencies need further development.

Very significant capabilities to assist in emergency response exist within the California National Guard, California Highway Patrol, the Departments of Health Services and Transportation, and the U.S. Department of Defense. Capabilities exist for such lifesaving activities as *aerial reconnaissance, search and rescue, emergency medical services, emergency construction and repair, communications, and emergency housing and food*. Current estimates by both Federal and State officials, however, indicate that at least 6 to 8 hours would be required before personnel and equipment can be mobilized and begin initial deployment to the affected area. During the period before the arrival of significant outside assistance critical to the saving of lives (especially of those trapped in collapsed buildings), the public would be forced to rely largely upon its own resources for search and rescue, first aid, and general lifesaving actions. The current level of public preparation for this critical phase of response can be described as only minimal. Much of the current state of preparedness arises from past programs aimed at a wide spectrum of emergencies, particularly civil defense against nuclear attack. New or strengthened programs are needed to enhance public preparedness.

FEMA has recently entered into a cooperative effort with California State and local governments to prepare an integrated prototype preparedness plan to respond to a catastrophic earthquake in Southern California or to a prediction of such an event. The plan's completion, in late 1981, promises to improve substantially the state of readiness to respond to the prediction and the occurrence of an earthquake in that area and to provide a model which could be applied to other earthquake-prone regions of California and the rest of the country.

F. FINDINGS, ISSUES, AND ACTIONS

The *ad hoc* committee responsible for this review developed several significant findings related to the

implications of major earthquakes in California and our capabilities to respond to them. It then identified major relevant issues raised by these findings and caused a number of actions to be taken. A brief discussion of the results of its review follows.

1. Leadership

=Finding=: *Effective leadership at all governmental levels is the single most important factor needed to improve this Nation's preparedness for a catastrophic earthquake in California.* The problem of emergency preparedness is severely complicated because responsibilities for preparation and response cut across normal lines of authority. Further complication arises from the large areal extent of the impacts expected from a major earthquake, affecting literally dozens of government entities. The emergency services coordinator at any level of government is effective only to the extent he or she is backed by the political leadership at that level. This is especially true when preparedness activities must be done, for the most part, within existing resources. City and county officials must increasingly accept their share of the responsibility for preparedness, but commitment by State or Federal leaders is also essential. The general tendency among elected officials and the public is to ignore the existing hazard problem. Experience, however, teaches that effective response mechanisms must be in place before the disaster; they cannot be developed in the time of crisis. Overcoming this apathy and developing the organizational arrangements among Federal, State, and local government and volunteer agencies--together with the private sector and the general public will require, above all, leadership.

=Issue=: The leadership role of the Federal Government in preparing for a catastrophic earthquake in California and how this leadership role is to be exerted require clarification.

=Action=: The President has communicated with the Governor of California to indicate the results of this review, to express concern about the need for cooperative leadership to prepare for the event, and to offer to increase the Federal effort with the State of California and local governments in the cooperative undertaking to prepare for a catastrophic earthquake. He stressed that the Federal role is to supplement the effort and resources of the State, and that commitment of significant Federal resources would be contingent upon the application of significant State resources. In his response to the President's communications, the Governor of California underscored the State's readiness to participate in this cooperative effort and announced his signing into law a measure that would provide substantial State resources (see annex 1). A summary of the new law (A.B. 2202) is contained in annex 3.

2. Management of Preparedness and Response Activities

=Finding=: *Preparedness must be developed as a partnership between Federal, State, and local governments with improvements needed at all levels*, as none have the resources or authorities to solve the problem alone.

=Issue=: Since the Nation faces a very probable earthquake in California sometime during the next 30 years, FEMA should provide the necessary leadership, management, and coordination required to strengthen planning and preparedness within the Federal Government, as delegated under the National Earthquake Hazards Reduction Program of 1977 and the Disaster Relief Act of 1974. In this effort, FEMA requires the support and assistance of numerous other Federal agencies.

=Actions=: FEMA is taking steps to:

» Strengthen significantly its management, research, application, and coordination functions, as delegated under the National Earthquake Hazards Reduction Program and Disaster Relief Act.

» Lead other agencies in the development of a comprehensive preparedness strategy detailing specific objectives and assignments, and periodically monitor accomplishments in meeting assigned responsibilities.

Departments and agencies with appropriate capabilities will provide needed support to FEMA in strengthening Federal preparedness and hazard mitigation programs.

=Issue=: A major deficiency that has been identified is the potential for delay following a catastrophic earthquake in processing a request for a Presidential declaration of a major disaster, and the subsequent initiation of full-scale Federal support for lifesaving actions. The first few hours are critical in saving the lives of people trapped in collapsed buildings; consequently, this is when Federal support is needed most. Decisions on post-event recovery aspects of Federal assistance can be deferred until lifesaving operations are underway and sufficient information about damage is in hand.

=Action=: FEMA will develop and negotiate, before the event, an agreement with the State of California which will enable the President to declare a major disaster and initiate full-scale Federal support for lifesaving and humanitarian action within minutes of a catastrophic earthquake. The agreement will defer resolution of issues relating to longer-term restoration and recovery and similar questions with large budgetary implications until adequate damage estimates are available. The Executive Branch will thus be able to arrive at an informed decision.

=Issue=: Significant improvements in the Federal, State, and local capability for coordination of operational response to a catastrophic earthquake are needed.

=Actions=: FEMA and other appropriate Federal agencies will increase their efforts, in a partnership with appropriate State and local agencies and volunteer and private-sector organizations, to:

» Complete development and agreement on fully integrated earthquake response plans for both the San Francisco and Los Angeles regions, including provision for predicted as well as unpredicted earthquakes, building upon the existing draft plan for San Francisco.

» Establish a small FEMA staff in California dedicated to the coordination of earthquake preparedness planning and implementation.

» Develop improved mechanisms for the coordination of medical and mortuary activities following a catastrophic earthquake.

» Identify and document the critical requirements for emergency communications--particularly non-telephonic communications--among Federal, State, and local agencies. Shortfalls between critical requirements and current capabilities, as well as remedial actions or recommended solutions for each will be identified in accordance with the "National Plan for Communications Support in Emergencies and Major Disasters." This review will include consideration of using existing satellite communications or a dedicated system, should it be found necessary.

» Cooperatively conduct practice response exercises with State and local officials that will prepare officials and the public for conditions that might be encountered in a catastrophic earthquake and that would reveal deficiencies in planning.

=Issue=: Improving the current inadequate preparedness of the public for a catastrophic earthquake requires a substantial increase in public information and public awareness. Although public information is primarily a State, local, and private-sector responsibility, the Federal Government has a role as well. Because citizens will have no choice but to rely largely upon their own resources in the first several hours immediately following a catastrophic earthquake, it is important that certain basic knowledge about lifesaving measures be very widely disseminated.

=Action=: FEMA will stimulate and work with the State of California and other appropriate groups to develop

and publicize earthquake awareness, hazard mitigation techniques, specific post-earthquake actions to be taken, including first aid, and other pertinent information.

=Issue=: The possibility of a credible, scientifically-based prediction of a catastrophic earthquake poses serious challenges to government and our society. The current level of scientific understanding of earthquake prediction and the available resources are such that present instrumentation efforts are directed toward research rather than maintaining extensive monitoring networks for real-time prediction. The transition from research to fully operational capability will require additional scientific understanding as well as resources. Earthquake predictions are possible, perhaps likely, however, from the current research effort. Even with a significant level of uncertainty, any scientifically credible prediction that indicates a catastrophic earthquake is expected within about 1 year or less, will require very difficult and consequential decisions on the part of elected officials at all levels of government. Decisions may include such possibilities as the mobilization of National Guard and U.S. Department of Defense resources prior to the event, the imposition of special procedures or drills at potentially hazardous facilities, such as nuclear reactors or dams, the condemnation or evacuation of particularly unsafe buildings with the subsequent need for temporary housing, and the provisions of special protection of fragile inventories. If the prediction is correct and appropriate actions are taken, thousands of lives can be saved and significant economic losses can be avoided. The costs of responding to a prediction may be substantial, however, and the commitment of resources undoubtedly will have to be made in the face of considerable uncertainty and even reluctance. Indeed, the possibility of an inaccurate prediction must be faced squarely.

=Actions=: FEMA, in conjunction with other appropriate Federal agencies, State and local governments, and volunteer and private-sector organizations, will increase its actions to develop procedures for responding to a credible, scientific earthquake prediction, including:

» Identification of constructive and prudent actions to be taken

» Analysis of the costs and benefits of various alternative actions

» Identification of roles and responsibilities in deciding which actions should be implemented and by whom

» Criteria for evaluating circumstances when the provision of Federal assistance would be appropriate

The U.S. Geological Survey of the Department of the Interior will:

» Maintain a sound and well-balanced program of research in earthquake prediction and hazard assessment based upon a carefully considered strategic plan

» Work with State and local officials and FEMA to develop improved mechanisms for the transmission of earthquake predictions and related information, and to plan for the utilization of the capability for earthquake prediction

3. Resources

=Finding=: While leadership and management are essential ingredients to achieve an adequate earthquake preparedness posture, *the availability of adequate staffing and resources at all levels of government determines the efficacy of agency programs and initiatives*. In many agencies, earthquake preparedness has been accorded a low priority in their programs. This is a manifestation of a more general problem of minimal agency resource allocation to emergency preparedness. The results of the actions that have been indicated will be limited unless additional resources are made available.

=Issue=: Additional resources should be provided as necessary to accelerate the earthquake hazard mitigation

and preparedness activities under the National Earthquake Hazards Reduction Program.

=Action=: FEMA has reassessed its priorities and is allocating resources to increase the staffing, funding, and management attention and direction for earthquake hazards mitigation, including preparations for a catastrophic earthquake in California. This includes an increase of staff resources in FEMA Region IX for Federal, State, and local coordination of planning, preparedness, and mitigation. Resource needs that cannot be fully met by the reassessment and reallocation for Fiscal Year 1981 should be identified and justified along with needs for Fiscal Year 1982 in the course of the budget submissions for Fiscal Year 1982. To facilitate an adequate and balanced response by other Federal agencies, FEMA will provide timely guidance to other agencies on specific priorities for this effort in relation to other major preparedness goals. The Office of Management and Budget and the Office of Science and Technology Policy will work together to develop a cross-agency ranking of budgetary resources for earthquake preparedness for Fiscal Year 1982.

CHAPTER II

GEOLOGIC EARTHQUAKE SCENARIOS

A. MAJOR EVENTS

For purposes of assessing the consequences of a major California earthquake, scenarios for seven large earthquakes were developed. The scenarios depict expectable earthquakes that could severely impact on the major population centers of California. In each case they are representative of only one possible magnitude of earthquake that could occur on the indicated fault system. On each fault system there is a greater probability of one or more damaging earthquakes of somewhat smaller magnitude than the postulated event. The postulated earthquakes are listed in the following table.

TABLE 1

MAJOR CALIFORNIA EARTHQUAKES

---------- Current Annual Likelihood Probability of of Occurrence Richter Occurrence in Next Region Fault System Magnitude[1] (Percent) 20-30 Years ----------

Los Angeles- Southern San Bernardino San Andreas 8.3 2-5 High

San Francisco Northern Bay Area San Andreas 8.3 1 Moderate

San Francisco Bay Area Hayward 7.4 1 Moderate

Los Angeles Newport- Moderate Inglewood 7.5 0.1 -Low

San Diego Rose Canyon 7.0 0.01 Low

Riverside Moderate- San Bernardino Cucamonga 6.8 0.1 Low

Los Angeles Santa Monica 6.7 0.01 Low ---------- [1] This is the estimated largest magnitude earthquake expected at a reasonable level of probability. The main shock can be expected to be followed by large aftershocks over a period of weeks or longer. Each large aftershock would be capable of producing additional significant damage and hampering disaster assistance operations. ----------

These earthquake scenarios represent the largest magnitude events estimated on the basis of a variety of geologic assumptions. The appropriateness of these assumptions depends on the intent of the analysis and the state of geologic knowledge. Therefore, the resulting estimates may not be appropriate for other purposes, such as the development of seismic design criteria for a specific site. The development of such criteria commonly requires detailed analyses of the site and its immediate geologic environment beyond the scope of this report. Consequently, detailed site analyses may require modification of the conclusions reached in this report, particularly fault systems other than the San Andreas and Hayward faults.

B. GEOLOGIC EVIDENCE

Some of the possible earthquakes listed are repeat occurrences of historical events, others are not, but geologic evidence indicates that earthquakes occurred on these faults before settlement of the region. Based on available data, the postulated earthquake magnitudes would be the largest events that could be expected at a reasonable level of probability. They represent a selection of events useful for planning purposes, but are by no means the only such events likely to occur either on these or other fault systems.

The historic record of seismicity in California is too short to determine confidently how often large earthquakes reoccur. Information on past earthquakes must be gleaned from the geologic record and therefore, presents a picture of past seismicity that is incomplete and not yet fully deciphered. Current knowledge about the recurrence of large earthquakes on specific faults is rudimentary. The probabilities of occurrence shown above are order-of-magnitude estimates and subject to considerable uncertainty, especially for the less probable events.

C. DESCRIPTION OF EVENTS

Following are brief descriptions of postulated events. Figure 1 gives their geographic location.

1. Los Angeles-San Bernardino/Southern San Andreas Fault (Magnitude 8.3)

For the past several thousand years, great earthquakes have been occurring over a 300 km length of the San Andreas fault approximately every 100 to 200 years, 140 years on the average. The last such event took place in 1857. The probability of occurrence of this earthquake is estimated to be currently as large as 2 to 5 percent per year and greater than 50 percent in the next 30 years. The fault skirts the edge of the Los Angeles-San Bernardino metropolitan region, thus most of the urbanized area lies further than 20 miles from the source of strong shaking. Because of the distance, shaking would be more hazardous for large structures than for one- to two-story houses. The long duration of shaking could trigger numerous slides on steep slopes and cause liquefaction in isolated areas.

2. San Francisco Bay Area/Northern San Andreas Fault (Magnitude 8.3)

A repeat occurrence of the 1906 earthquake, in which the San Andreas fault broke over 400 km of its length, would cause severe damage to structures throughout the Bay Area and adjacent regions. The extensive urban development on lowlands and landfill around San Francisco Bay would be especially hard hit and liquefaction in many of these areas would intensify the damage to structures erected on them.

3. San Francisco Bay Area/Hayward Fault (Magnitude 7.4)

The last large events to occur on this fault were in 1836 and 1868. Should a major earthquake occur, severe ground shaking and liquefaction is expected to cause damage throughout the entire circum-bay area nearly as severe as that resulting from a 1906-type earthquake on the San Andreas fault. This earthquake would be of particular concern because of the many dams located along or near the fault.

4. Los Angeles/Newport-Inglewood Fault (Magnitude 7.5)

This earthquake would be a serious threat to the nearby, densely-populated areas of Los Angeles. Shaking would cause extensive structural damage throughout the Los Angeles Basin and liquefaction near the coast would add still more destruction.

5. San Diego Area/Rose Canyon Fault (Magnitude 7.0)

This fault--a segment of an active zone of faults extending from the Newport-Inglewood fault to Northern Mexico--would present the greatest earthquake risk to the San Diego area. Severe damage due to shaking and liquefaction could be expected in the coastal areas. Because of unstable sea-bed sediments in the offshore area, local tsunamis (tidal waves) are possible.

6. Los Angeles/Santa Monica Fault (Magnitude 6.7 and 7.0) and Riverside/San Bernardino/Cucamonga Fault (Magnitude 6.8)

These faults are part of a system of east-west tending faults bordering the northern edge of the Los Angeles basin. This fault system caused the 1971 San Fernando earthquake and is geologically similar to the system that generated the large 1952 Kern County earthquake. Although smaller in magnitude than the earthquakes previously described, these postulated events are potentially quite dangerous because of their vicinity to high population densities in Southern California.

D. EARTHQUAKE EFFECTS

Detailed maps were prepared for each event showing qualitative estimates of ground shaking intensity resulting from each earthquake. These estimates are indicative of the general severity of damage to ordinary structures. Empirical formulae providing quantitative estimates of peak ground motion at various distances from the postulated earthquakes were developed for use in the effects of severe ground shaking on individual structures or critical facilities. No estimates were made of localized effects, such as ground failures related to liquefaction (the complete failure or loss of strength, of a saturated soil due to shaking), landslides, and fault rupture. These effects can be far more destructive than ground shaking alone.

[Illustration: Figure 1. Geographic Locations of Selected Regional Events]

CHAPTER III

ASSESSMENT OF LOSSES FOR SELECTED POTENTIAL CALIFORNIA EARTHQUAKES

A. INTRODUCTION

As part of a program that FEMA and its predecessor agencies have had underway for a number of years, property loss and casualty estimates were prepared in 1972 and 1973 for a number of potential maximum credible earthquakes that could impact on the San Francisco and the Los Angeles areas--North San Andreas (Richter magnitude 8.3), Hayward (Richter magnitude 7.4), South San Andreas (Richter magnitude 8.3), and Newport-Inglewood (Richter magnitude 7.5). These estimates have now been updated as part of the current assessment.

Estimates of property loss and casualties are based on the expected type and distribution of damage for each postulated earthquake as determined by the size and location of the earthquake and the distribution and character of the buildings and structures within the affected area. Methodologies for estimates of this type are approximate at best. Consequently, the figures shown below may vary upward or downward by as much as a factor of two or three. This degree of uncertainty does not affect the validity of the conclusions of this report,

however, since there are greater uncertainties in all other aspects of emergency response planning.

B. PROPERTY LOSS ESTIMATES

The property loss estimates were obtained by first estimating the total replacement dollar value of buildings and their contents, multiplying them by percentage loss factors (inferred from the anticipated strength of shaking in each county), and then summing to obtain the aggregate loss. Included in the estimates are private as well as Federal, State, and local government buildings, insured and uninsured. Excluded from consideration is the replacement value of transportation and communication facilities, dams, utility installations, and special purpose structures (e.g., convention centers and sports arenas). Also excluded is the potential damage resulting from a major dam failure or the indirect dollar losses due to such factors as higher unemployment, lower tax revenue, reduced productivity, and stoppage of industrial production. Experience indicates that indirect losses could be approximately equal to the dollar amounts lost in buildings and their contents. The property loss estimates for four postulated earthquakes on the faults listed below are as follows.

TABLE 2

ESTIMATES OF PROPERTY LOSSES FOR REPRESENTATIVE EARTHQUAKES[1]

---------- Loss to Loss of Building Contents Total Loss Fault ($ in Billions) ($ in Billions) ($ in Billions) ---------- Northern San Andreas 25 13 38 Hayward 29 15 44 Newport-Inglewood 45 24 69 Southern San Andreas 11 6 17 ---------- [1] Uncertain by a possible factor of two to three. ----------

C. CASUALTY ESTIMATES

Deaths and injuries in these earthquakes principally would occur from failures of man-made structures, particularly older, multistory, and unreinforced brick masonry buildings built before the institution of earthquake-resistant building codes. Experience has shown that some modern multistory buildings--constructed as recently as the late 1960's, but not adequately designed or constructed to meet the current understanding of requirements for seismic resistance--are also subject to failure. Consequently, the number of fatalities will be strongly influenced by the number of persons within high-occupancy buildings, capable of collapsing, or by failure of other critical facilities such as dams. Additional imponderables are the degree of saturation of the ground at the time of the event and the possibility of weather conditions conducive to the spread of fire. A conflagration such as occurred in the 1906 San Francisco earthquake, is not considered likely to occur in any of the analyzed events, however, because of improvements in fire resistance of construction and firefighting techniques. Nonetheless, numerous smaller fires must be anticipated in any of the analyzed events and a "Santa Ana type" wind could cause serious problems.

An additional element of uncertainty in estimating casualties from earthquake stems from not knowing where most of the population will be at the time of the earthquake. In the early morning (i.e., 2:30 a.m.) most people are at home, by far the safest environment during a seismic emergency. At 2:00 in the afternoon, on the other hand, the majority of people are at their places of employment and therefore vulnerable to collapse of office buildings. Around 4:30 p.m. many more people are in the streets and thus subject to injury due to falling debris or failures of transportation systems. Consequently, depending on the time of day, wide variations in the number of casualties can be expected.

Following are estimates of dead and injured (requiring hospitalization) for each of the four representative faults and for the three time periods just discussed.

TABLE 3

ESTIMATES OF CASUALTIES[1]

---------- Fault Time Dead Hospitalized[2] ---------- Northern San Andreas 2:30 a.m. 3,000 12,000 2:00 p.m. 10,000 37,000 4:30 p.m. 11,000 44,000

Hayward 2:30 a.m. 3,000 13,000 2:00 p.m. 8,000 30,000 4:30 p.m. 7,000 27,000

Southern San Andreas 2:30 a.m. 3,000 12,000 2:00 p.m. 12,000 50,000 4:30 p.m. 14,000 55,000

Newport-Inglewood 2:30 a.m. 4,000 18,000 2:00 p.m. 21,000 83,000 4:30 p.m. 23,000 91,000 ---------- [1] Uncertain by a possible factor of two to three.

[2] Injuries not requiring hospitalization are estimated to be from 15 to 30 times the number of deaths.

D. OVERVIEW OF OTHER TYPES OF DAMAGE

For this assessment, estimates of damage to substantial numbers of different type facilities essential to the immediate response capability were updated. Earthquakes associated with the same four major fault systems identified earlier in this chapter were used as a basis for these estimates. The types of facilities analyzed included *hospitals*, *medical supply storages*, *blood banks*, and *custodial care homes*, together with their essential services and personnel resources. Although newer hospitals in California are being built according to substantially improved seismic safety standards and practices, older hospital facilities can be expected to be poorly resistant to earthquakes.

Among residential buildings, single family homes are expected to suffer structural damage and loss of contents. Damage to multifamily dwellings--particularly older buildings--would, in all likelihood, be more extensive. Analysis of expected damage indicates that temporary housing for as many as 200,000 families might be needed--a requirement calling for careful planning and exceptional management skills.

Schools are judged to be among the safest facilities exposed to the earthquakes. Since passage of the Field Act in 1933, after the Long Beach earthquake, school buildings in California have been continuously improved to withstand seismic hazards.

As a result of continuing and substantial upgrading of design and construction practices in the past 10 years, dams and reservoirs can be expected to show an improved performance in an earthquake. Nonetheless, on a contingency basis, one dam failure might be assumed for each planning effort.

Realizing the fact that 84 key communications facilities, earth stations, Department of Defense voice and data switches, commercial transoceanic cable heads, Federal Telecommunications System switches, and major direct distance dial switches are located within 55 miles of either Los Angeles or San Francisco, damage must be expected to occur. With this realization, priorities have been assigned to all critical circuits transiting the key facilities, based on established criteria of criticality of service continuity. *National warning systems circuitry, command and control circuits, and circuits supporting diplomatic negotiations* (of which a high concentration exists in California) are examples of those circuits carrying high-restoration priority.

In the civil sector there would be 24 to 72 hours of minimal communications, with a possible blackout of telephonic communications in the area immediately following an earthquake. The commercial carriers would institute network control procedures to regain control of the situation as fast as possible.

The impact on transportation facilities in any of the four hypothesized earthquakes could be massive. Since

the magnitude and severity is unprecedented in recent years, conclusions regarding losses must be accepted as tentative. As in the case of hospitals, however, the lessons learned in earthquakes during the past 10 years are being incorporated in the design and construction of new facilities.

In general, all major transportation modes would be affected--*highways*, *streets*, *overpasses and bridges*, *mass transit systems*, *railroads*, *airports*, *pipelines*, and *ocean terminals*, although major variances in losses are expected among the modes. From a purely structural standpoint, the more rigid or elevated systems (such as railroads and pipelines) which cross major faults on an east-west axis would incur the heaviest damage, with initial losses approaching 100 percent. Other major systems (such as highways, airports, and pile-supported piers at water terminals) have better survivability characteristics and therefore would fare much better, with damage generally in the moderate range of 15 to 30 percent. These transportation facility loss estimates are stated in terms of immediate post-quake effects. They do not reflect the impact of priority emergency recovery efforts and expedient alternatives that are available, some within hours, to aid in restoration of transportation capacity. In addition, transportation systems generally have an inherently significant degree of redundancy and flexibility. Consequently, an unquantified but significant movement capability in all transport modes is expected to survive. Finally, these loss estimates do not take into account the question of availability of essential supporting resources, particularly petroleum fuels, electricity, and communications. In the initial response phase, these could prove to be the most limiting factors in the capability of the transportation system.

Business and industry would be affected by damage to office buildings, plants, and other support facilities. Although the 1971 San Fernando earthquake occurred on the margin of a largely suburban area, industrial facilities incurred significant damage. For example, several buildings of the kind commonly used for light industry or warehouses suffered from collapsed roofs or walls. Generally, building codes do not apply to special industrial facilities, and the ability of these structures to resist earthquake shaking will depend largely on the foresight of the design engineer. For example, a major electrical power switching yard and a water filtration plant were seriously damaged in the 1971 San Fernando earthquake.

About 10 percent of the population and industrial resources of the Nation are located in California. Over 85 percent of these resources (or about 8.5 percent of the Nation's total) are located in the 21 California counties that are subject to the possibility of damage from a major earthquake. Much of the aerospace and electronics industry is centered in California. For example, about 56 percent of the guided missiles and space vehicles, 40 percent of the semiconductors, 25 percent of the electronic computer equipment, and approximately 21 percent of the optical instruments and lenses manufactured in the Nation are manufactured in these 21 counties. The probability that all these counties would be affected by one earthquake is extremely remote; yet the significant concentration of key industries remains a concern. For example, about 25 percent of the Nation's semiconductors are manufactured in Santa Clara County, an area along the Northern San Andres fault that suffered very heavy damage in the 1906 San Francisco earthquake. Estimates of damage to these industrial facilities and the resulting loss of production have not been made. Similarly, the resulting impact of possible damage to national production has not been adequately analyzed.

Federally regulated financial institutions were generically analyzed to determine their ability to continue to promote essential services in the event of a major earthquake like those that have been postulated for this assessment. The conclusion reached thus far is that large-magnitude earthquakes pose no significant or unanticipated problems of solvency and liquidity for such institutions. The Federal Reserve System and other regulatory entities have procedures in place that are designed--and have been tested--specifically to provide for the continued operation of financial institutions immediately following an earthquake or other emergency.

CHAPTER IV

AN ASSESSMENT OF THE CURRENT STATE OF READINESS CAPABILITY OF FEDERAL, STATE, AND LOCAL GOVERNMENTS FOR EARTHQUAKE RESPONSE

A. INTRODUCTION

An earthquake of catastrophic magnitude, with or without credible warning, happens suddenly. The potential for disaster, however, does not occur suddenly. The degree of preparedness and commitment to comprehensive planning and mitigation programs for the inevitable event will largely determine the degree of hardship to be experienced through loss of life, human suffering, property destruction, and the other related economic, social, and psychological aspects of disruption to day-to-day community activities. The impacts can be reduced substantially from current expected levels through the development and implementation of improved and more widely practiced earthquake hazards reduction measures. These include *coordinated emergency preparedness plans and procedures*, *earthquake prediction and warning systems*, *improved construction techniques*, and *effective public education and information programs*.

The State of California Office of Emergency Services (OES) and FEMA conducted an analysis of the readiness capability for potential catastrophic earthquakes in California at the Federal, State, and local government levels. The planning of 22 counties and 38 cities, of 34 State agencies, and of 17 Federal organizations were reviewed with the following objectives: (a) identify opportunities for improvement; (b) provide a basis for making decisions that would strengthen program direction and planning efforts; and (c) specify resource needs and potential legislative initiatives. Annex 2 summarizes current Federal and California earthquake planning.

The environment in which preparedness planning in California occurs is characterized by the following observations of public expectations and attitudes:

» There is widespread public support for government action.

» Most people have some ideas as to what government should be doing.

» There is understanding of the need for hazard reduction as well as emergency response planning.

» People are willing, in the abstract, to have government funds spent for hazard mitigation.

» The public is not very satisfied with what government officials have done.

» Public officials perceive that current preparedness plans and response are inadequate at best.

As discussed below, the review indicates that all is not well in earthquake plans and preparedness. Current plans and preparedness are judged to be adequate for the "moderate" earthquakes most likely to occur frequently in California. By moderate it is meant an event causing property damage on the order of $1 to $2 billion. Such an event, however, will severely tax existing resources and provide a major test of management relationship among different governmental jurisdictions and levels. For a catastrophic earthquake, current plans and preparedness are clearly inadequate, leading to a high likelihood that Federal, State, and local response activities would become disorganized and largely fail to perform effectively for an extended period of time.

B. STATE AND LOCAL RESPONSE

Although there are widely differing approaches, local emergency planning in California generally consists of a basic plan and a series of contingency plans. The basic plan establishes the authority, sets forth references, addresses hazard vulnerability, states the planning assumptions, establishes an emergency services organization, assigns tasks, formulates a mutual aid system, and directs the development of specific support annexes. For those hazards identified in the basic plan, a separate contingency plan is then developed to address the unique nature of the hazardous event. The contingency plan contains service support plans for

each of the functional operations, including detailed standard operating procedures. The planning efforts of local jurisdictions are coordinated with adjacent jurisdictions and the California OES for consistency.

A plan is not considered complete without the support annexes which make the plan operational. The survey undertaken for this assessment disclosed that approximately 93 percent of the jurisdictions examined have existing, basic plans; 50 percent have completed annexes; 28 percent of the basic plans addressed an earthquake hazard vulnerability; 35 percent have planned for earthquake contingency; and only 1 percent (one city) has a plan to respond to an earthquake prediction.

At the State level, the California OES, as an integral part of the Governor's Office, functions as his immediate staff and coordinating organization in carrying out the State's emergency responsibilities. Specific emergency assignments have been made to 34 State agencies by the OES Director through a series of Administrative Orders. During emergencies the activities of these agencies and departments are coordinated by the California OES.

The State OES is also responsible for maintaining and updating the California Emergency Plan (CEP) and associated readiness plans. As in the case of local plans, the basic document is supported by operational annexes as listed below:

CONTINGENCY MUTUAL AID

Earthquake Fire and Rescue Earthquake Prediction Law Enforcement Oil Spill Medical Nuclear Blackmail Utilities Reactor Accident Military Support Radioactive Material Incident Flood

SUPPORTING SYSTEMS EMERGENCY RESOURCES MANAGEMENT

Warning Construction and Housing Emergency Broadcast System Economic Stabilization Emergency Public Information Food Intelligence Operations Health Radiological Defense Industrial Production Manpower Petroleum Telecommunications Transportation Utilities

Based on this planning concept, the review assessed quantitatively the preparedness activities of the 34 State agencies that have preparedness responsibilities in accordance with the CEP. The quantitative data are listed in the following table.

TABLE 4

QUANTITATIVE ASSESSMENT OF STATE PREPAREDNESS ACTIVITIES

---------- Number of Percent of Preparedness Element Agencies 34 Agencies ---------- Existence of Plan 22 65 Conduct of Exercises 27 79 Public Education Activities 10 29 Public Information Activities 9 26 Operational Capability 32 94 ----------

The quality of the plans, activities, and operational capabilities were then evaluated on a scale of 1 (expected to fail/inadequate) to 5 (expected to succeed well/adequate). The qualitative results are shown below.

TABLE 5

QUALITATIVE ASSESSMENT OF STATE PREPAREDNESS ACTIVITIES

---------- Preparedness Element Capability Rating ---------- Planning 2.67 Exercises 2.64 Public Education 1.44 Public

Information 1.50 Operational Capability 2.91 ----------

It should be emphasized that these ratings apply to the State's *present* level of planning and preparedness for response to a major destructive earthquake (magnitude 8), not a moderate (San Fernando-type) event.

C. FEDERAL RESPONSE

At the Federal level the principal capability to respond to a catastrophic earthquake in California resides in FEMA, the agency responsible by law to coordinate Federal activities in all emergencies. FEMA has developed a basic plan for supplemental Federal assistance for a major earthquake in the San Francisco Bay area. This plan, however, covers only the emergency phase of response (first few days of efforts to save lives and protect property). In addition, FEMA is participating in a broader effort concentrating in Southern California. This cooperative effort is getting under way with State and local governments, other Federal departments, voluntary agencies, practicing professions, business and commercial interests, labor, educators, and researchers. It is expected to develop an effective program to respond to an earthquake or a credible earthquake prediction in that part of the State. The emphasis is being placed on *public safety, reduction of property damage, self-help on the part of individuals, socioeconomic impacts, improved response and long-range recovery planning, mitigation activities, and public participation for both the post-prediction and immediate post-earthquake periods*. This pilot effort is expected to be usable in other highly seismic areas of California as well as in other States.

In the event of a catastrophic earthquake, a substantial number of Federal agencies would provide support to and be coordinated by FEMA. Illustrative are the following:

1. Department of Defense (DOD)

Initially, local military commanders may provide necessary support to save lives, alleviate suffering, or mitigate property damage. Normally, additional DOD resources would not be committed until a presidential declaration of an emergency or major disaster. When this occurs, the Secretary of the Army is DOD Executive Agent for military support. The Commander, Sixth U.S. Army, at the Presidio, San Francisco, has been further delegated authority to coordinate disaster relief operations in the western portion of the United States. Extensive planning and coordination have taken place between the Sixth U.S. Army and FEMA Region IX. DOD emergency functions include: *damage survey*, *search and rescue*, *emergency medical care*, *identification and disposition of dead*, *emergency debris clearance*, *emergency roads and bridge construction*, *airfield repair*, and *identification and demolition of unsafe structures*. Specific units have been identified to respond to an earthquake in any of the major population centers of California. For example, at this time the following units would be prepared for commitment within 8 hours after a disaster is declared by the President:

» Six medical units with a 1,320 bed capacity

» Seven helicopter units with 90 utility helicopters and 36 medium helicopters

» One Infantry brigade of 1,500 personnel

» Two engineer units with 78 pieces of heavy equipment

» Two transportation units with 124 cargo trucks and trailers

These as well as additional DOD assets could be made available, contingent on defense priorities.

2. The National Communication System

This Agency's plan, the "National Plan for Communications Support in Emergencies and Major Disasters," provides for planning and using national telecommunications assets and resources during presidentially declared emergencies and major disasters. The plan, which has been exercised repeatedly in past disasters, provides the management structure and the communications staff to support FEMA. Restoration priorities have been assigned to all critical circuits.

3. Department of Transportation (DOT)

DOT has established an Office of Emergency Transportation. This office has developed and maintains comprehensive emergency plans and procedural manuals for natural disasters and other civil crises. It constantly monitors the civil transportation system for indications of potential adverse impacts from all hazards. It conducts scheduled periodic training and readiness exercises for DOT emergency personnel and maintains quick response cells and emergency operating facilities at DOT headquarters and in the field to provide an immediate reaction capability. The system has been activated several times in the recent past (e.g., Three Mile Island, 1979 Energy/Fuel Crisis, Independent Truckers' Strike, and the Mt. St. Helens eruption).

D. CONSIDERATIONS FOR IMPROVING RESPONSE CAPABILITY

Earthquake prediction has not been incorporated into existing plans. Response to predictions in the current environment, if given, would be *ad hoc*. The State of California has only a rudimentary plan and the Federal Government none. The City of Los Angeles has examined the problem extensively, but only considers its own jurisdiction and has not produced an actionable plan. Current planning for the recovery period is incomplete, uncoordinated, and not functional. State and local governments have done little to plan for the recovery period when, following the emergency lifesaving phase, efforts and resources are concentrated on restoring the functioning of the community. They presume that the Federal Government will "step in" after a presidential declaration. The Federal Government has an untested draft plan for the San Francisco area that is not fully coordinated with the State plans. Current Federal plans are geared to the provision of assistance on the order of a few hundred million dollars. Thus, there is little confidence that they would function under the requirements for tens-of-billions-of-dollars and concomitant service demands.

Both Federal and State agencies need to commit the financial resources and assignment of personnel to maintain and enhance earthquake plans and preparedness. Earthquake preparedness, although responding to high damage expectation, is still based upon a relatively low probability occurrence. When it is in competition with pressing social needs for a portion of limited resources, social needs tend to prevail at all levels of government. Without a clear commitment, future development of earthquake preparedness, as in the past, is problematic and its implementation is in considerable doubt. The Federal earthquake preparedness effort needs to focus on a high state of readiness.

History in the area of natural hazard mitigation suggests that assignment of responsibility, even by the President, when not followed by leadership and regular oversight over the allocation of financial resources, seldom leads to programs which can be expected to function. The same weakness is evidenced at the State and local government levels with few exceptions. The stresses likely to occur in emergency response programs after a catastrophic earthquake will be such that effective response will require a cooperative, integrated effort among different jurisdictions and levels of government.

Experience in other areas of planning and preparedness, particularly for civil defense, indicates that damage to existing programs occurs when the Federal Government raises expectations of the public and of other levels of government and then fails to follow through with implementation and funding. It is better to maintain the *status quo* with minor changes at the margin than to announce substantial program initiatives and not meet their requirements.

CHAPTER V

AN ASSESSMENT OF THE SOCIAL IMPACTS

Often, it is assumed that disasters leave masses of the population in the impacted areas dazed and helpless and unable to cope with the new conditions, or that those not so immobilized panic or display antisocial behavior. Another common assumption is that local communities and organizations are rendered ineffective to handle the many problems, leading to further disorganization, loss of morale, and requiring the quick assertion of "strong" outside leadership and control.

Practical experience and field studies of disasters indicate that these assumptions are not necessarily correct. The widespread sharing of danger, loss, and deprivation produces an intimate cooperativeness among the survivors, which overcomes social isolation and provides a channel for very close communication and expression and a major source of physical and emotional support and reassurance. This capacity seems to account for the resiliency of personality and social organization in dealing with threat and danger. It is also at the base of the ability of social life to regenerate.

In addition, a good case can be made in that community systems experiencing impact may be more efficient and rational than they are in "normal" circumstances. Normal (pre-disaster) community life traditionally operates at a low level of effectiveness and efficiency. Activities are directed toward a very diffuse set of goals, just as human resources within the community are inadequately utilized. Upon disaster impact, certain community goals--care for victims and the restoration of essential services--develop a high priority while others are ignored or held in abeyance. Thus, the entire range of community resources, even taking into account "losses," can be allocated to the accomplishment of the more critical goals. Also, human resources are better utilized. Many women, older persons, younger persons, and members of minorities now become "productive;" the "labor" market after impact is open to those underutilized resources. In effect, then, disasters create the conditions for the more efficient utilization of material resources and the more effective mobilization of human resources.

To accomplish this, certain modifications have to occur in the normal community structure, since the usual decision-making structures are designed for a different range and type of problem. Outsiders see this restructuring process as disorganized, chaotic, and creating the necessity for the imposition of some strong outside authority. On the contrary, this restructuring process is functional and adaptive. Its consequences are seen in communities and societies that rebound dramatically from the disruption and destruction to levels of integration, productivity, and growth capacity far beyond the pre-disaster state.

In summary, the picture drawn points to the capacity of individuals and institutions to deal with difficult problems created by disaster impact. It also points to the adaptive capacity of social organization within communities to deal with unique and dramatic problems. These findings are not an argument against planning nor against "outside" assistance, but they should condition both the nature of planning and the direction of assistance.

ANNEX 1

LETTERS OF CORRESPONDENCE

THE WHITE HOUSE

WASHINGTON

September 19, 1980

To Governor Jerry Brown

As you know, following my trip to view the destructive impacts of the volcanic eruption of Mt. St. Helens in the State of Washington, I directed that an assessment be undertaken of the consequences and state of preparedness for a major earthquake in California. This review, chaired by my Science and Technology Advisor, Frank Press, is now complete. We are grateful for the assistance provided by your staff and the other State, and local officials in this effort.

Although current response plans are generally adequate for moderate earthquakes, Federal, State, and local officials agree that additional preparation is required to cope with a major earthquake. Prudence requires, therefore, that we take steps to improve our preparedness.

While the primary responsibility for preparedness rests with the State of California, its local governments and its people, the magnitude of human suffering and loss of life that might occur and the importance of California to the rest of the Nation require increased Federal attention to this important issue. Accordingly, I have directed that the Federal government increase its work with you to supplement your efforts. The Federal efforts will be led by the Federal Emergency Management Agency and include the Department of Defense and other Departments and agencies as appropriate.

As a Nation, we must reduce the adverse impacts of a catastrophic earthquake to the extent humanly possible by increasing our preparedness for this potential eventuality.

Sincerely,

[signed] Jimmy Carter

The Honorable Edmund G. Brown, Jr. Governor of California Sacramento, California 95814

September 26, 1980

The Honorable Jimmy Carter The President The White House Washington, D.C. 20500

Dear Mr. President:

Let me take this opportunity to review our conversations over the last few months regarding increased seismic activity in California.

When we met in Oakland on July 4 I raised the issue of seismic hazards. I was concerned then with the steady increase in seismic activity in California since 1978. Sharing my concern, you directed that the National Security Council join with my staff and certain local experts to conduct a quick study on the potential for a great earthquake in California.

As you know, significant theoretical and public policy research had already been completed by our Seismic Safety Commission, State Geologist, Earthquake Prediction Evaluation Council and the Office of Emergency Services. Together with the U.S. Geological Survey and the Federal Emergency Management Agency (FEMA), they had clearly been keeping abreast of the state of the art of earthquake prediction. Indeed, combined state and federal efforts, founded on major theoretical advances in American, Russian and Chinese seismic and geological theory since the early 1970s, had shifted the language of earthquake prediction in California from "if" to "when"!

In light of my personal interest in this subject, I have signed into law Assemblyman Frank Vicencia's AB 2202, a jointly funded state-federal project to design a comprehensive earthquake prediction-response plan. It

is the state's intention to prepare a plan for the greater Los Angeles area as quickly as feasible. In my view, such a fullscale prediction-response program had become possible only after the research findings of both physical and policy scientists during the past five years. It is my conviction that such a plan is now timely--neither too early nor too late.

In this context, your recognition of this issue in our conversation of September 22 in Los Angeles was a welcome personal reinforcement of our state and local efforts. I am also grateful for the September 3 briefing in Sacramento by Mr. John Macy, Director of FEMA, regarding the latest U.S. Geological Survey interpretations of anomalies around California's system of geological faults. As soon as we have received the final FEMA report on the details of those anomalies, I will ask the state geologist to evaluate the report, confer with colleagues in the Geological Survey and have all state and local officials fully briefed.

At that time, I would be grateful for an early opportunity to meet with you and explore next steps. I am confident that a heightened state of awareness among my fellow Californians will so deploy the resources of the state, plus available federal supplementary assistance, as to minimize the loss of life and property in the event of a great earthquake.

Sincerely,

/s/

Edmund G. Brown, Jr. Governor

ANNEX 2

CURRENT CALIFORNIA AND FEDERAL EARTHQUAKE RESPONSE PLANNING

A. NATURE OF EMERGENCY PLANNING

An emergency, as used in this report, is defined as an unexpected, sudden or out-of-the-ordinary event or series of events adversely affecting lives and property which, because of its magnitude, cannot be handled by normal governmental processes. Emergency response planning is the process that addresses preparedness for and response to an emergency.

Emergency response planning is an evolutionary, ongoing process and is prerequisite to all other emergency readiness activities. It is a comprehensive process that identifies the potential hazardous events, and the vulnerability to such hazards, estimates expected losses, and assesses impacts of such events. The development of written plans is followed by placement of capabilities to implement the response plan and by the conduct of periodic tests and exercises. The most difficult task in the development of an emergency plan is to anticipate as many of the problems and complications resulting from a given disaster situation as possible and to provide a basis for response to those not anticipated.

The objective of emergency planning is to create the capacity for government to:

» Save the maximum number of lives in the event of an emergency

» Minimize injuries and protect property

» Preserve the functions of civil government

» Maintain and support economic and social activities essential for response and the eventual long-term recovery from the disaster

Emergency planning is a logical and necessary pre-emergency activity for governmental (and other organizational) entities likely to be affected by a disaster's occurrence. To be successful, such planning must be accomplished within the framework of the day-to-day governmental structure and activity but at the same time provide for response to the extraordinary circumstances and requirements inherent in disaster situations.

Emergency plans include the preparation of guidelines, policy directives, and procedures to be utilized in preparing for and conducting disaster operations, training, and test exercises. They should also contain clear statements of authorities, responsibilities, organizational relationships, and operating procedures necessary for the accomplishment of disaster response and recovery activities. Further, they should address the four elements of mitigation, preparedness, response, and recovery (immediate and long-term).

Once plans are established they must be periodically updated as conditions change. Updating may become necessary for a number of reasons: increased scientific, technical, and managerial knowledge; feedback from evaluation of exercises; better understanding of vulnerability; shifts in population and economic activities; construction of new critical facilities; and changes in personnel, organization, and legislation.

Emergency planning is a shared responsibility at all levels--in this case from the Federal through the State and local jurisdictional levels. It should include business, industry, research and scientific institutions, practicing professions, and the individuals. By involving all functions of government, the planning process enhances the capability for implementing the plans through the realistic consideration of available capabilities and elimination of conflicts and inconsistencies of roles and task assignments.

Further, by being a part of the planning decision-making process and having identified the needs and areas of consideration, individuals, organizations, and officials responsible for emergency operations are better able to relate to the expected impact and the operational environment. The written plans also serve valuable purposes for training and familiarization of new organizations, individuals, and public officials. Experience has shown repeatedly that when emergency operations are conducted in accordance with existing plans, reaction time is reduced and coordination improved, with fewer casualties, less property damage, and a higher surviving socioeconomic capability to undertake recovery. Other benefits that accrue from planning include the enhancement of hazard awareness.

B. CALIFORNIA EMERGENCY PLANNING RESPONSE

The State of California emergency response planning is a series of related documents, each of which serve a specific purpose. (See figures 1 and 2.)

The basic plan of a jurisdiction (item (1) in figures 1 and 2) is the foundation of this planning process. It is an essential administrative (rather than operational) document, and as such it:

» Provides the basis (including legal authority) for and the objectives of emergency planning and operations

» Outlines contingencies (emergency situations) to be planned and prepared for and establishes the general principles and policies (concepts of operations) to be applied to each

» Describes the emergency organization in terms of who is responsible for what actions

» Defines interjurisdictional and interservice relationships and the direction and control structure to make assignments and resolve conflicts

» Contains or refers to information of common interest about supporting facilities, such as the Emergency Operations Center and warning and communications systems

» Provides the planning basis for other supporting documents which are more operationally oriented

The basic plan is supported by a Direction and Control annex and by functional annexes (see (2) and (3) respectively in figures 1 and 2). The Direction and Control annex details how overall responses to an emergency will be managed and coordinated. Functional annexes (for both staff and services) are designed to address the extraordinary requirements created by emergencies. They identify the specific needs, the organizational resources available to meet those needs, and the scheme or "concept of operations" for their application. It should be noted that, because of unique requirements, annexes often do not reflect normal departmental structure. An annex becomes a departmental plan only when an agency represents the sole resource for meeting the stated need and when satisfying that need is the only task assigned to that agency by the basic plan.

The second major portion of the California State planning structure consists of specific contingency plans (see (4) in figures 1 and 2). One such plan is prepared for each extraordinary emergency or disaster, likely to occur, detailing the probable effects of the emergency on the jurisdiction and the actions to be taken in offsetting these effects. It is also called a "response plan" since it describes the operations to be undertaken to deal with catastrophic situations. Contingency plans include service support plans and checklists (see (5) and (6) respectively in figures 1 and 2). Each involved element of the emergency organization details its response actions in Service Support Plans and itemizes functions appropriate to the specific contingency. The contingency plans, service support plans, and related checklists and standard operating procedures constitute the "operational" portions of the overall emergency plan. They address internal procedures to accomplish stated objectives and document, in advance, the specific organizational elements that will respond to each type of disaster or "need," with identification of procedures and resources.

The third major part of California's overall State plan is a compendium of information and resources needed to cope with emergencies (see (7) in figures 1 and 2). This includes references describing the control structure (Emergency Operations Center locations, communications, key facilities, personnel lists, and equipment source listings).

C. FEDERAL EARTHQUAKE RESPONSE PLANNING

Most Federal agencies operating within the State have a generic emergency response plan that establishes their internal procedures for responding to disasters. Certain agencies such as the Corps of Engineers and the Federal Highway Administration, which provide services and support that are used on a regular and fairly extensive basis in disaster, tend to have more highly developed disaster response plans. Some of them even have rather basic earthquake response segments included in their basic plans. Thus, for moderate earthquakes these plans are relatively effective and the Federal response can be expected to be at least adequate. Few Federal agencies, however, have developed any specific plan that is adequate to respond to the demands of a catastrophic event causing property damage exceeding the $2 billion range. Of 24 Federal agencies whose earthquake planning status were recently evaluated by FEMA Region IX, only the Sixth U.S. Army was determined to have developed a comprehensive capability that is in acceptable detail, has been exercised, and appears to be operationally adequate and reliable. Other Federal agencies are now beginning to perceive the need to improve their planning and response capability following the expected event, and are gradually responding to this need.

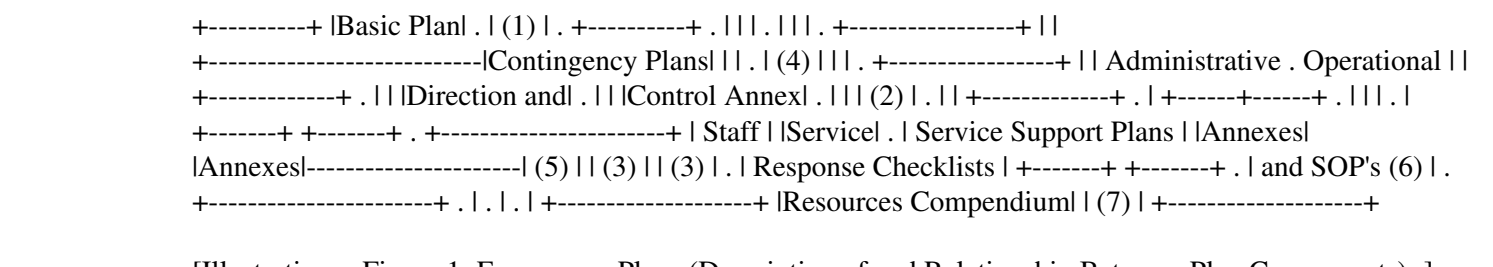
Providing impetus to this expanded planning activity has been the emergence of the FEMA Region IX Earthquake Response Plan for the San Francisco Bay Area. This is a site-specific FEMA plan based on a 1974 draft that provided for a full range of Federal assistance during the emergency lifesaving phase following the earthquake. Although this plan never proceeded beyond the draft stage (because of evolving FEMA disaster field operations policy), it served as the basic guide for the development of the Sixth U.S. Army Plan, and has remained a core document for identifying expected Federal agency activities for earthquake recovery in the San Francisco Bay area. In 1979, the emergency response portion of the 1974 FEMA Region IX draft was

restructured. The conduct of the post-event response program was shifted from being a centrally directed FEMA activity under the operational control of the Regional Director to a decentralized operation which provides for functional disaster support activities to be assigned by the Regional Director to certain Federal agencies by Mission Assignment Letters. Table 1 indicates functional task assignment areas. Those with the designation "Emergency Support Function (ESF)," have been assigned to other Federal agencies. Table 2 reviews the principal and support agency assignments for each of the ESF functions.

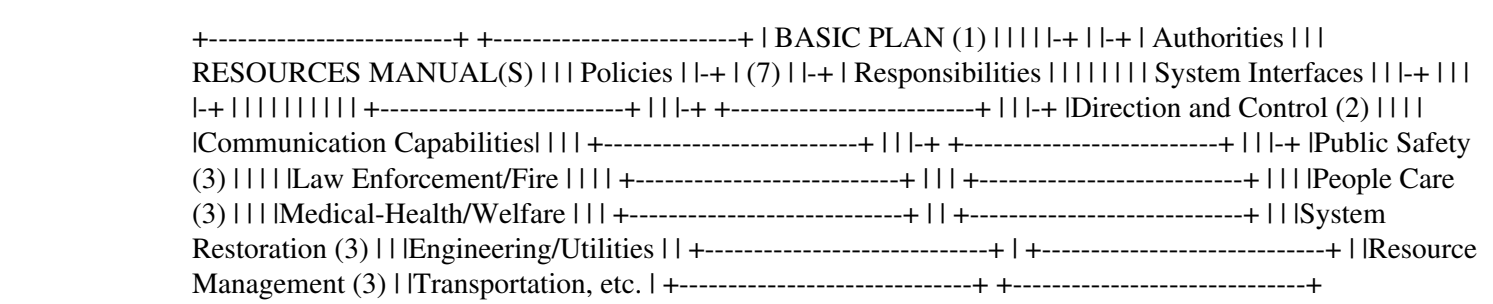
On the basis of these anticipated mission assignments, the tasked Federal agencies participated in the development of operational annexes in the 1979 version of the San Francisco Earthquake Response Plan. Upon completion of the annexes, all agencies were then required to develop the necessary agency support plans and standard operating procedures for accomplishing the mission assignment tasks. Additionally, those Federal agencies designated in the plan as principal agencies were tasked with the responsibility of organizing and coordinating the activities of Federal agencies designated as support.

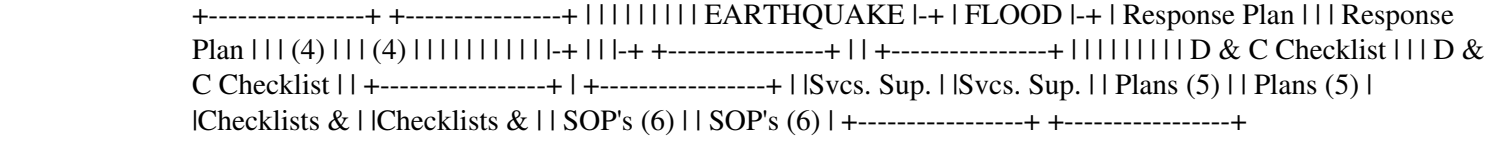
The rationale for this approach was to identify the various functional areas of disaster response for which a Federal activity could reasonably be expected to maintain after the occurrence of the event. With the functional areas identified, the range of Federal agency talent was evaluated and Federal response capabilities matched to expected functional demands. By the development of a matrix (figure 2), a total of 16 functional response areas (such as transportation, mass care, and debris removal) were identified, and 20 Federal agencies, plus volunteer organizations such as the American National Red Cross, were designated as having appropriate disaster response capabilities. Subsequently, all agencies were rated on their capability for functioning in a principal or a support capacity. These agencies were then provided specific FEMA Region IX Mission Assignments or tasking statements which, when triggered by a Presidential disaster declaration, provide the legal basis for delivering the authorized assistance in response to State and local government needs.

The end result of this approach has been to create a much more effective and reliable capability to respond to the needs of an earthquake disaster by those Federal agencies from which a significant response would be required.



[Illustration: =Figure 1: Emergency Plans (Description of and Relationship Between Plan Components)=]





+----------------+ +----------------+ | | | WAR | | |-+ | |-+ | WAR | | | | | Response Plan | | | Response Plan | | | (4) | | | (4) | | | In-Place | | | Crisis | | | Protection | |-+ | Relocation | |-+ +----------------+ | | +----------------+ | | | | | | | | | D & C Checklist | | | D & C Checklist | | +-----------------+ | +-----------------+ | |Svcs. Sup. | | Svcs. Sup. | | Plans (5) | | Plans (5) | |Checklists & | | Checklists & | | SOP's (6) | | SOP's (6) | +-----------------+ +-----------------+

[Illustration: =Figure 2: Emergency Planning Format (A Partial Illustration of the Component Parts of a Jurisdictional Emergency Plan)=]

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY REGION IX EARTHQUAKE RESPONSE AND ASSISTANCE TASKS

(San Francisco Bay Area)

ANNEXES TO BASIC PLAN

Disaster Field Activities Disaster Field Location Mission Assignments Emergency Transportation (ESF-1)[1] Communication (ESF-2) Emergency Debris Clearance (ESF-3) Fire Fighting (ESF-4) Emergency Roads, Airfields, and Bridges (ESF-5) Emergency Demolition (ESF-6) Administrative Logistical Support (ESF-7) Emergency Medical Care (ESF-8) Search and Rescue (ESF-9) Identification and Disposal of Dead (ESF-10) Warnings of Risks and Hazards (ESF-11) Emergency Distribution of Medicine (ESF-12) Emergency Distribution of Food (ESF-13) Emergency Distribution of Consumable Supplies (ESF-14) Emergency Shelter & Mass Care (ESF-15) Damage Reconnaissance (ESF-16) Isoseismal Analysis Authorities Referral Administration

[1] Emergency Support Functions (ESF) are cross-referenced by number in table 2.

TABLE 2

EMERGENCY SUPPORT FUNCTIONS

KEY: a: Emergency Transportation b: Emergency Communications c: Emergency Debris Clearance d: Fire Fighting e: Emerg. Roads, Air Fields & Bridges f: Emergency Demolition g: Logistical Support h: Emergency Medical Care i: Search and Rescue j: Identif. & Disposal of Dead k: Warnings of Risks & Hazards l: Emergency Dist. of Medicine m: Emergency Dist. of Food n: Emergency Dist. of Consum. Supplies o: Emerg. Shelter, Feed, & Mass Care p: Damage Reconnaissance

+--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |ESF | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10| 11| 12| 13| 14| 15| 16| +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |ANNEX |(D)|(E)|(F)|(G)|(H)|(I)|(J)|(K)|(L)|(M)|(N)|(O)|(P)|(Q)|(R)|(S)| +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ | FEDERAL | | | | | | | | | | | | | | | | | AGENCIES | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o | p | +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |DOT - FAA | S | | | | | | | S | | | | | | | | S | +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |DOT - FHWA | S | | | | S | | | | | | | | | | | S | +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |DOT - FRA | S | | | | | | | | | | | | | | | S | +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |DOT - RETCO-9 | P | | | | | | | | | | | | | | | | +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |DOT - UMTA | S | | | | | | | | | | | | | | | S | +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |DOT - USCC | S | S | | S | | S | | | S | | | | | | | S | +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |DOD - 6th USA | S | S | S | S | S | S | S | P | P | | S | S | S | S | P | +--------------+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+ |DOD - COE | | S | P | S | P | P | | |

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ANNEX 3

ASSEMBLY BILL NO. 2202

The Governor of California signed into law Assembly Bill 2202 on September 25, 1980, which, among others, provides for State participation in a joint Federal, State, and local program to prepare a comprehensive program for responding to a major earthquake prediction. This action was initiated in January 1980 through the actions of the Assembly Committee on Government Organization, Frank Vicencia, Chairman. Inclusions of specific funds for preparedness was included following a subcommittee on Emergency Planning and Disaster Relief hearing on possible earthquake prediction on April 22, 1980. The text of the Law follows:

Assembly Bill No. 2202

CHAPTER 1046

An act to amend Section 8897 of, to amend and renumber Section 8898 of, and to add Section 8895.1 to, the Government Code, relating to the Seismic Safety Commission, making an appropriation therefor, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor September 25, 1980. Filed with Secretary of State September 26, 1980.]

LEGISLATIVE COUNSEL'S DIGEST

AB 2202, Vicencia. Seismic Safety Commission.

The Seismic Safety Commission Act, which will self-repeal, effective January 1, 1986, establishes the Seismic Safety Commission, and confers upon it various powers and duties relating to earthquake hazard reduction. The California Emergency Services Act confers various related powers and duties upon the Governor, the Director and the Department of Emergency Services, and the California Emergency Council.

This bill would amend the Seismic Safety Commission Act by: changing the basic subject of the powers and duties of the commission to earthquake hazard mitigation and making certain corresponding changes in its powers and duties; including within commission responsibilities, scheduling on its agenda as required, a

report on disaster mitigation issues from the Office of Emergency Services and defining, for such purposes, "disaster" as all natural hazards which could have an impact on public safety; and authorizing the commission to exercise various specified powers in relation to other disasters, as so defined, in connection with issues or items reported or discussed with the Office of Emergency Services at any commission meeting.

This bill would also require the commission to initiate, as specified, a comprehensive program to prepare the state for responding to a major earthquake prediction, as specified.

This bill would appropriate $750,000 for the purposes of this act.

This act would take effect immediately as an urgency statute.

Appropriation: yes.

The people of the State of California do enact as follows:

SECTION 1. Section 8895.1 is added to the Government Code, to read:

8895.1. The commission shall initiate, with the assistance and participation of other state, federal, and local government agencies, a comprehensive program to prepare the state for responding to a major earthquake prediction. The program should be implemented in order to result in specific tools or products to be used by governments in responding to an earthquake prediction, such as educational materials for citizens. This program may be implemented on a prototypical basis in one area of the state affected by earthquake predictions, provided that it is useful for application in other areas of the state upon its completion.

SEC. 2. Section 8897 of the Government Code is amended to read:

8897. The commission is responsible for all of the following in connection with earthquake hazard mitigation:

(a) Setting goals and priorities in the public and private sectors.

(b) Requesting appropriate state agencies to devise criteria to promote earthquake and disaster safety.

(c) Scheduling a report on disaster mitigation issues from the Office of Emergency Services, on the commission agenda as required. For the purposes of this subdivision, the term disaster refers to all natural hazards which could have impact on public safety.

(d) Recommending program changes to state agencies, local agencies, and the private sector where such changes would improve earthquake hazards and reduction.

(e) Reviewing the recovery and reconstruction efforts after damaging earthquakes.

(f) Gathering, analyzing, and disseminating information.

(g) Encouraging research.

(h) Sponsoring training to help improve the competence of specialized enforcement and other technical personnel.

(i) Helping to coordinate the earthquake safety activities of government at all levels.

(j) Establishing and maintaining necessary working relationships with any boards, commissions, departments,

and agencies, or other public or private organizations.

SEC. 3. Section 8898 of the Government Code is amended and renumbered to read:

8897.1. To implement the foregoing responsibilities, the commission may do any of the following:

(a) Review state budgets and review grant proposals, other than those grant proposals submitted by institutions of postsecondary education to the federal government, for earthquake related activities and to advise the Governor and Legislature thereon.

(b) Review legislative proposals, related to earthquake safety to advise the Governor and Legislature concerning such proposals, and to propose needed legislation.

(c) Recommend the addition, deletion, or changing of state agency standards when, in the commission's view, the existing situation creates undue hazards or when new developments would promote earthquake hazard mitigation, and conduct public hearings as deemed necessary on the subjects.

(d) In the conduct of any hearing, investigation, inquiry, or study which is ordered or undertaken in any part of the state, to administer oaths and issue subpoenas for the attendance of witnesses and the production of papers, records, reports, books, maps, accounts, documents, and testimony.

(e) In addition, the commission may perform any of the functions contained in subdivisions (a) to (d), inclusive, in relation to other disasters, as defined in subdivision (c) of Section 8897, in connection with issues or items reported or discussed with the Office of Emergency Services at any commission meeting.

SEC. 4. The sum of seven hundred fifty thousand dollars ($750,000) is hereby appropriated from the General Fund to the Seismic Safety Commission for carrying out the provisions of Section 8895.1 of the Government Code as added by this act, contingent upon receipt of matching federal funds.

SEC. 5. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting such necessity are:

In order to protect the public safety against earthquakes, including the imminent possibility of major earthquake predictions being made within the next 12 months, it is necessary that this act take effect immediately.

ACKNOWLEDGEMENTS

=National Security Council Ad Hoc Committee on Assessment of Consequences and Preparation for a Major California Earthquake=

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