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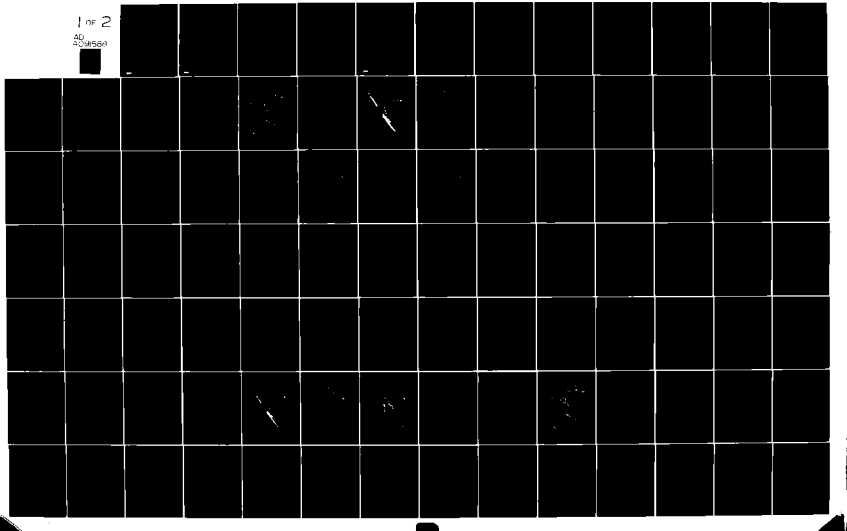

MULTIJURISDICTIONAL RESPONSES TO URBAN AND REGIONAL DISASTERS

Final Report

October 1980

Prepared for:

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON, D.C. 20472

Contract DCPA01-79-C-0353

(SRI International Project HSU-8838)

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SRI International

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: (none)	2. GOVT ACCESSION NO.: AD-A092568
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): MULTIJURISDICTIONAL RESPONSES TO URBAN AND REGIONAL DISASTERS	5. TYPE OF REPORT & PERIOD COVERED: FINAL REPORT
	6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): M. Mark Earle, Thomas W. Fletcher, Ernest C. Harvey, and Charles K. Shafer	8. CONTRACT OR GRANT NUMBER(s): DCPA01-79-C-0353
9. PERFORMING ORGANIZATION NAME AND ADDRESS: SRI International, 333 Ravenswood Avenue, Menlo Park, CA 94025	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: No. 2314-C
11. CONTROLLING OFFICE NAME AND ADDRESS: Federal Emergency Management Agency, Washington, D.C. 20472	12. REPORT DATE: October 30,1980 / 13. NO. OF PAGES: 189
14. MONITORING AGENCY NAME & ADDRESS (if diff. from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this report)

Approved for Public Release; Distribution Unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Earthquake scenario
Reconstruction priorities
Multijurisdictional decisionmaking
Disaster Recovery
Public/private interaction
Simulation exercise

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents the results of an assessment of the multijurisdictional issues needing resolution after the immediate needs of an urban population affected by a major disaster have been met. A scenario incorporating the impacts of and immediate responses to an earthquake of magnitude 8.3 on the Richter scale in the San Francisco Bay Area was developed to provide the basis for identifying and classifying these issues. The many entities that would need to participate in issue resolution or in the implementation of decisions made were also identified and categorized to facilitate the issue analysis.

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19. KEY WORDS (Continued)

20 ABSTRACT (Continued)

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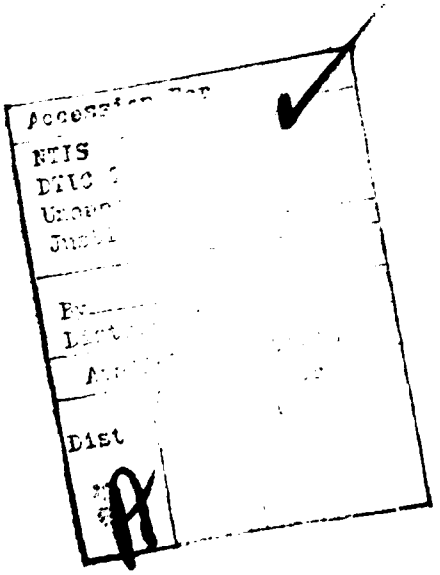

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MULTIJURISDICTIONAL RESPONSES TO URBAN AND REGIONAL DISASTERS

Detachable Summary

Final Report

October 1980

Prepared by: M. Mark Earle
Thomas W. Fletcher
Ernest C. Harvey
Charles K. Shafer

Prepared for:

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON, D.C. 20472

Contract DCPA01-79-C-0353

(SRI International Project HSU-8838)

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MULTIJURISDICTIONAL RESPONSES
TO URBAN AND REGIONAL DISASTERS

SRI Project HSU-8838
Contract No. DCPA 01-79-C-0353

DETACHABLE SUMMARY OF REPORT

The research reported here was designed to prepare a simulation exercise to test the interrelationships among federal, state, and local government agencies, quasi-public organizations, private-sector companies, public interest groups, and individuals in resolving multijurisdictional issues associated with the recovery/reconstruction period following a major natural disaster. A simulation exercise was developed to involve federal, state, and local leaders in the decisionmaking activities that should be taking place after the immediate needs of the affected population have been met. A scenario comprising a severe earthquake (Richter magnitude 8.3) in the San Francisco Bay Area and the assumed responses of individuals, governments, and other organizations during the ensuing week provides the background for defining the issues needing resolution and sets the stage for the simulation exercise.

In the scenario, all Bay Area counties have experienced severe damage from the earthquake, although assessments are not yet complete. More than 10,000 fatalities have been confirmed as of the end of the first week; about 30,000 persons require hospitalization, and an additional 28,000 require outpatient care. Emergency facilities have been set up in the counties most severely affected, and some casualties have been moved out of the area. About 43,000 residential dwellings have been destroyed, must be demolished, or require extensive repairs. There are about 38,000 persons homeless, and more than 70,000 are living in heavily damaged homes; emergency feeding and mass-care shelters are operating throughout the area.

There is extensive damage to industrial and commercial buildings, utilities, and transportation facilities, particularly in the built-up areas

adjacent to San Francisco Bay. All urban fires have been extinguished but forest/brush fires are still out of control in the hilly areas of several counties. Debris clearance is under way, and limited road access is possible to all cities and to most sections of San Francisco and Oakland. Emergency provisions have been made for utility services, but commercial service functions are not yet operating in the severely affected areas.

Although individuals and public- and private-sector entities are still heavily involved in "immediate response" activities, important issues relating to reconstruction must be addressed. For purposes of designing the simulation exercise, they are classified as follows:

- Reconstruction policies and priorities
- Leadership roles
- Coordination of critical emergency services
- Transitional governance
- Phasing of people-serving activities
- Physical reconstruction activities.

In practice, the immediate response functions will continue for as long as needed; these are a part of the coordination of critical emergency services and transitional governance sets of issues. But decisions need to be made regarding reconstruction policies and priorities, specifically land use designations for seismically vulnerable areas and bases for allocating available resources from inside and outside the Bay Area. The specific roles of federal, state, and local governments, the private sector, and quasi-public agencies need to be agreed on; and detailed plans need to be made to implement the priorities for phasing in retail and service activities and accomplishing the massive reconstruction in an orderly fashion.

These decisions are difficult because of the fragmented character of local government and the multitude of federal and state agencies and private-sector entities that should be involved in the reconstruction

effort. Specifically, zoning, land use, and building code decisions are made at the city or county level (with some specific state requirements), but regional or coordinated local decisions will need to be made if the reconstruction is to incorporate significant changes from the former status quo. According to federal and state earthquake response plans, 27 federal and 39 state agencies have specific functional responsibilities for the emergency response period. These would continue as needed; some would be assigned reconstruction functions, and other agencies not involved in emergency functions would assume responsibility for particular aspects of the reconstruction effort.

In addition to state and federal jurisdictions, the Bay Area includes 9 counties, 93 cities, 182 school districts, and 692 special districts. Specific functions important to reconstruction, such as building inspection and demolition, debris clearance, or highway and street construction are highly fragmented geographically. Comparable private-sector functions are also fragmented. This is particularly true of construction--there are more than 8,800 construction contractors of various types in the Bay Area--but is also a characteristic of finance, services, trade, and other activities.

The simulation exercise is designed to put local leaders, both in and out of government, and the appropriate representatives of higher levels of government in the position of making the decisions required to ensure an effective reconstruction effort. In practice, there will be many meetings involving the different stakeholders before final decisions are made and a reconstruction program is under way. To capture the major problems and decision requirements, the simulation incorporates three critical elements:

- A meeting called by the Governor to plan for initiation of reconstruction efforts in the Bay Area. Participants would include the relevant state departments, FEMA, 6th Army, the Federal Regional Council, Association of Bay Area Governments, and some private-sector representatives. The purpose would be to set goals and priorities and to organize an agenda for and plan the participation in a regional meeting to be attended by federal, state, and local government representatives.

- A regional meeting chaired by the California Office of Emergency Services (OES) and including appropriate federal and state officials and selected local government representatives. This is an important element in the simulation because regional problems will have to be faced and discussed and priorities set at a forum where most governmental interest groups are represented.

- A local meeting to assess the decisions (or compromises) made at the regional meeting. These could be of two types: meetings with local leaders who did not participate in the regional meeting to obtain their reaction and inputs, or city council (or county board of supervisors) meetings to report on and get reactions to the regional decisions and priorities.

The participants at each meeting will be briefed on the disaster scenario before the meeting, and the critical issues needing resolution will be reviewed. The meetings should be free flowing but follow an agenda that will require goals and priorities to be set and decisions reached. Both the regional and local meetings can be replicated if found to be useful as training devices.

The outputs expected from the simulation exercise include:

- Improved understanding of the multijurisdictional issues inherent in the reconstruction process and of the divergent views regarding solutions.

- A basis for reconstruction guidelines to be included in federal, state, and local disaster plans.

- A stimulus to advance planning to facilitate reconstruction in the event of a major disaster.

- A format for simulating the decision process in other areas with respect to other types of disaster.

ABSTRACT

This report presents the results of an assessment of the multijurisdictional issues needing resolution after the immediate needs of an urban population affected by a major disaster have been met. A scenario incorporating the impacts of and immediate responses to an earthquake of magnitude 8.3 on the Richter scale in the San Francisco Bay Area was developed to provide the basis for identifying and classifying these issues. The many entities that would need to participate in issue resolution or in the implementation of decisions made were also identified and categorized to facilitate the issue analysis.

Within the framework of the scenario and the issue categorization, a simulation exercise was prepared. It is designed to test the interactions of federal, state, and local governments, quasi-public organizations, private-sector companies, and individuals in resolving the major issues and mobilizing the available resources for the reconstruction effort.

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I INTRODUCTION

Extensive research and planning activities have focused on the immediate response to natural disasters. The federal government has developed guidelines; and federal agencies, states, and local governments have prepared emergency response plans in accordance with these guidelines. Some testing of these plans has been attempted in areas subject to natural disasters, and the responses of the relevant entities to actual disasters have been assessed.

However, the intermediate-response period--the period when critical decisions relating to recovery need to be made--has received little research and planning attention. These decisions are particularly difficult because they require priorities to be set for recovery activities and because they are, for the most part, multijurisdictional in nature. Even the immediate-response planning appears not to have given adequate treatment to the problems of coordination among multiple independent public, quasipublic, and private-sector entities.

The work reported here is designed to raise the level of understanding by public and private sector leaders of the interfaces among the various entities and of the planning and decisionmaking mechanisms required to ensure effective responses to disasters. The specific objectives of the research are to:

- Identify the critical issues requiring multijurisdictional decisionmaking in the intermediate-response period.
- Prepare a classification of entities with decisionmaking responsibilities in a substate geographic area.
- Design a participative political-economic simulation exercise to explore the mechanics and processes of multijurisdictional decisionmaking relating to reconstruction.

The simulation exercise is designed to place decisionmakers in the position of establishing reconstruction goals, setting priorities, and working with a variety of entities with varying pressures and agendas.

The study approach incorporated the following:

- Thorough review of the literature relating to disaster planning.
- Specification of geographic area and disaster characteristics for simulation purposes.
- Collection and analysis of disaster plans of federal, state, and local governments applicable to the area selected.
- Interviews with government officials and representatives of quasi-public and private-sector entities.

The analytical framework developed to accomplish the study objectives incorporates the following elements:

- A disaster scenario to provide a basis for identifying issues requiring multijurisdictional decisions and for the design and implementation of a simulation exercise.
- A description of the primary issue areas requiring multijurisdictional decisions to ensure a coordinated effective reconstruction effort after a major disaster.
- A three-element simulation exercise involving federal, state, and local government officials and representatives of quasi-public organizations, the private sector, and public interest groups.

Section II of the report summarizes a scenario based on a severe earthquake in the San Francisco Bay Area; it is described in more detail in Appendix A. Section III outlines the major issue areas requiring resolution after the immediate needs of the population affected by such a disaster have been met. The discussion is supported by Appendix B which provides a more detailed description of the issues facing decisionmakers after a major natural disaster, and Appendix C, which provides background on the complex characteristics of the various public- and private-sector entities that would be involved in reconstruction.

Section IV outlines the criteria used in designing the simulation exercise and presents a three-part simulation designed to test:

- Federal/state interactions and roles in reconstruction.
- Priority setting involving federal, state, and local entities at the regional level.
- Interactions among governments, interest groups, and individuals at the local level.

The outputs expected from the simulation exercise--with specific reference to issue areas described in Section III--are also discussed. A draft quideline document to be used in the simulation exercise is included as Appendix D. The requirements for implementation and assessment of the simulation exercise are discussed in Section V.

II A DISASTER SCENARIO

To provide a framework for identifying the critical issues associated with reconstruction that will require decisions of a multijurisdictional nature, a scenario was prepared describing the impact on the San Francisco Bay Area of an earthquake of magnitude 8.3 on the Richter scale, occurring on the San Andreas fault with the epicenter near Bolinas in Marin County. The scenario assumes that the earthquake occurred at 7:30 a.m. on Tuesday, October 30, 1979.

Figure 1 shows the portion of the Bay Area included in the Isoseismal Area in a 1972 NOAA study, which was used as a major source of basic data on the impact of a severe earthquake on the Bay Area.* The map indicates, by means of roads and city designations, the areas of relatively dense population. The two major faults are also shown--San Andreas in the West Bay and Hayward in the East Bay. The major built-up areas tend to lie between the bay and the fault line on both sides of the bay. Interstate 280 and two reservoirs are in the San Andreas Fault zone.

The detailed scenario is presented in Appendix A. A summary of fatalities and casualties, property damage and impact on the infrastructure is included in this section, along with a description of the assumed responses of government and nongovernment entities during the first week and a

*"A Study of Earthquake Losses in the San Francisco Bay Area," a report prepared for the Office of Emergency Preparedness by U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1972. Other references are listed in Appendix E.

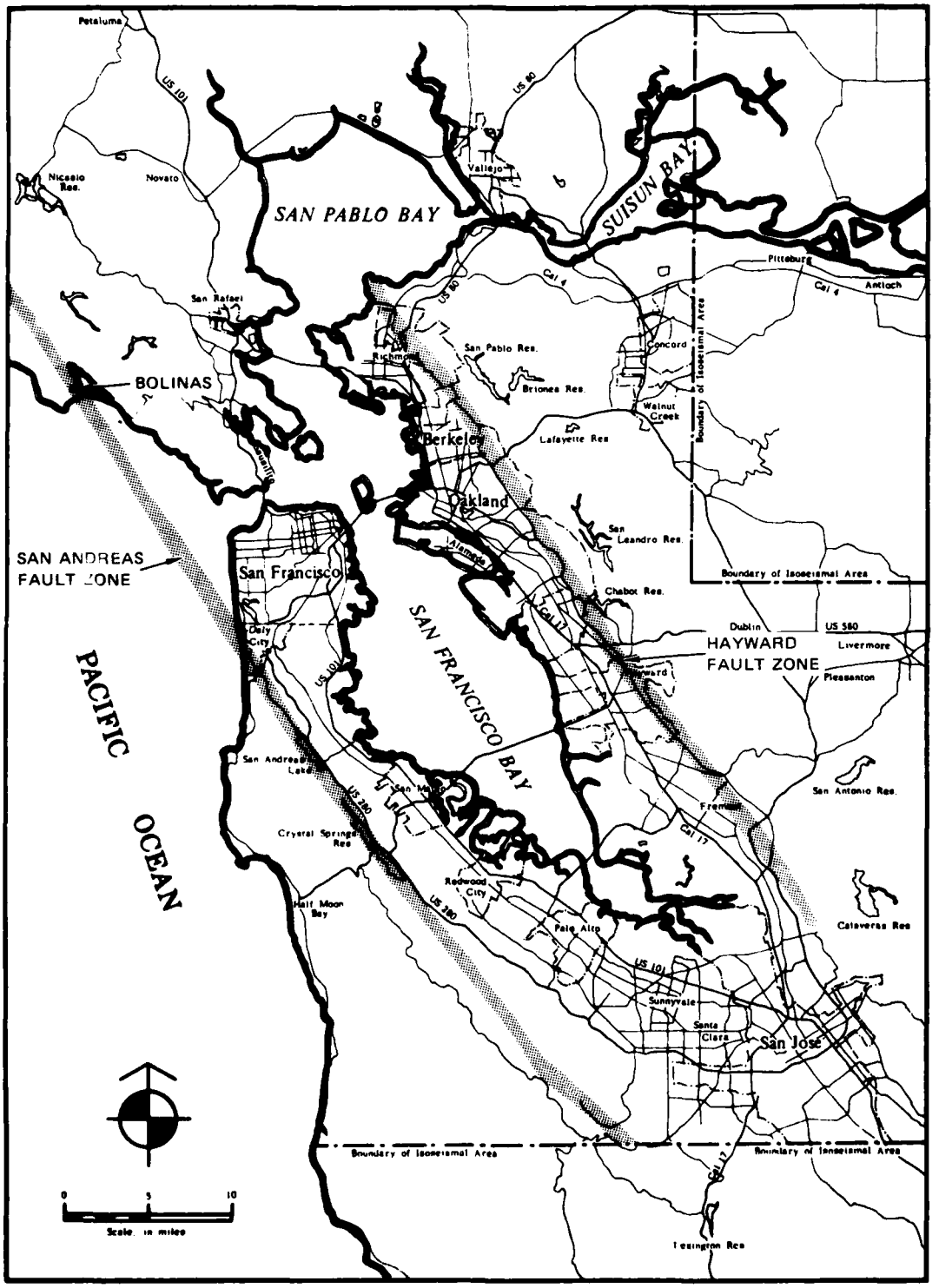


FIGURE 1 THE AFFECTED AREA

situation statement as of D+7.* Based on this material, the reconstruction problems needing resolution and the types of interjurisdictional decisions that are required are discussed in Section III.

Impact of the Earthquake

Figures 2 and 3 indicate the physical impacts of the magnitude 8.3 earthquake. Intensities of VIII to X (see Table 1) characterize the Peninsula and South Bay portions of the Bay Area; intensities are somewhat less in the East and North Bay, but range from VI to X. There are areas of potential soil liquefaction in many parts of the Bay Area, corresponding to areas of structurally poor ground and fill land. Landslide hazards are, for the most part, confined to remote areas. Comparison of Figures 2 and 3 with Figure 1 indicates that severe damage can be expected in the heavily built-up built-up areas on both sides of the bay, but particularly on the Peninsula from Palo Alto north.

For purposes of analysis, the earthquake is assumed to occur at 7:30 a.m. on a Fall workday. There are 50 aftershocks of more than magnitude 4 during the first 48 hours, followed by smaller tremors during the rest of the first week. The scenario traces the events during this period but emphasizes conditions as of D+7 to provide specific input to the analysis of issues relating to reconstruction that will require multijurisdictional decisions. Although all Bay Area counties are affected by the earthquake, the discussion in the report concentrates on those most severely impacted--San Francisco, San Mateo, Santa Clara, and Alameda--and the simulation exercise is designed to reflect these severe conditions.

*In the notation adopted here, D designates the day of the earthquake; and D+1, D+2, etc., designate the first day, the second day, etc., after the day of the earthquake.

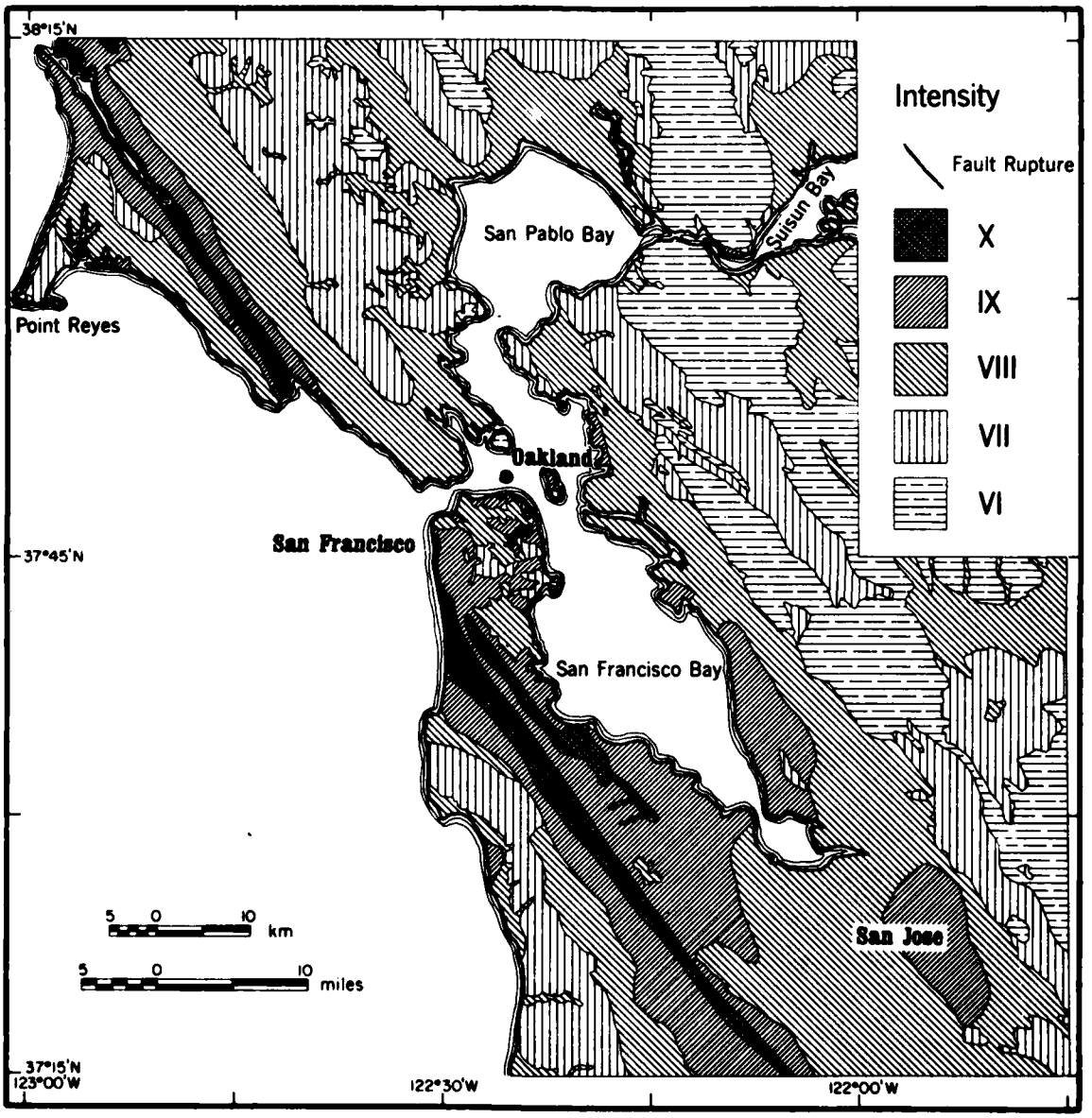


FIGURE 2 INTENSITY DISTRIBUTION FROM A MAGNITUDE 8.3 EARTHQUAKE ON THE SAN ANDREAS FAULT

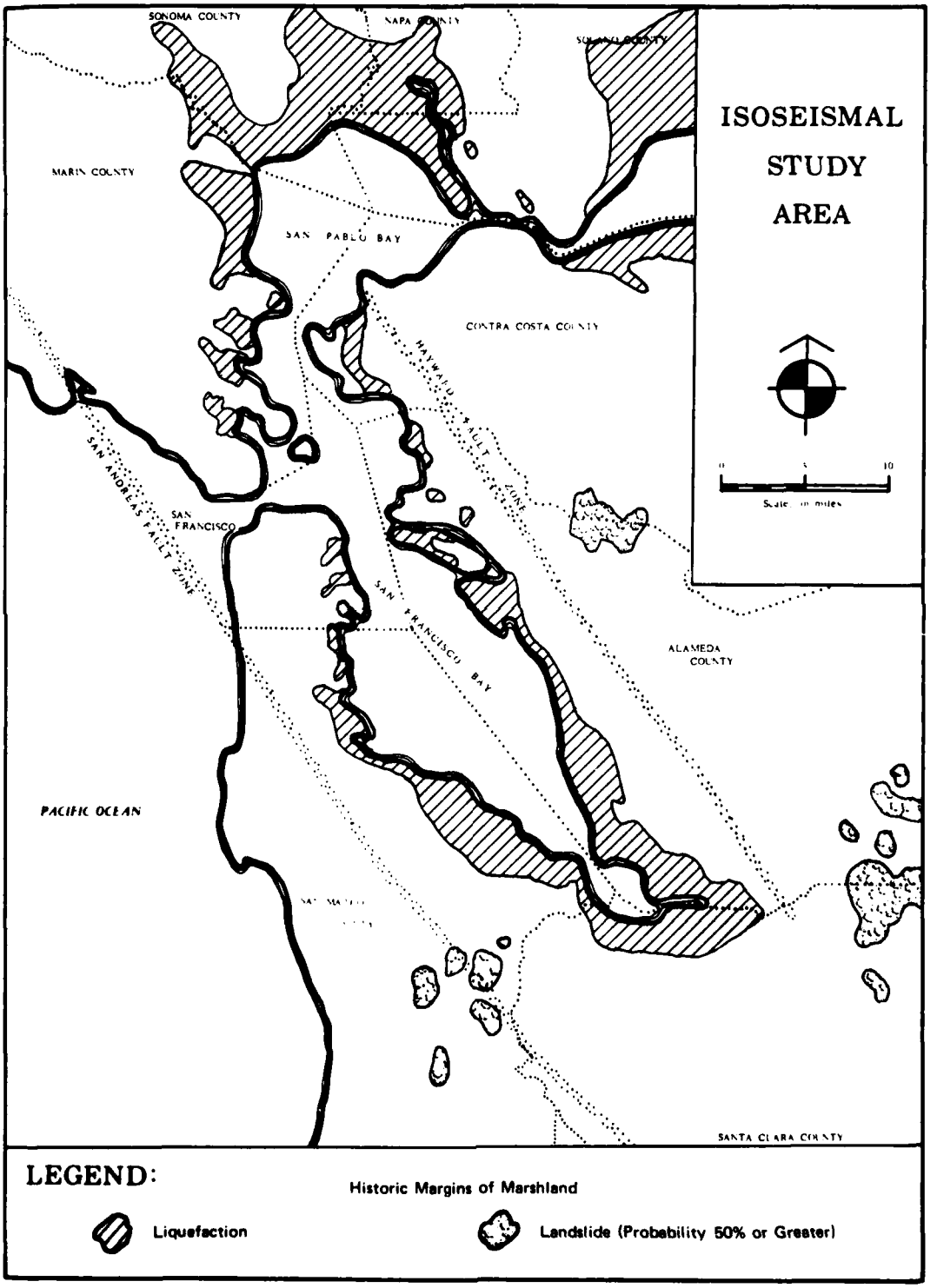


FIGURE 3 AREAS OF MAJOR POTENTIAL LIQUEFACTION AND LANDSLIDES HAZARDS

Table 1

INTENSITY AND MASONRY DEFINITIONS

Definitions of Intensity*

VI. Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church, school). Trees, bushes shaken (visibly, or heard to rustle).

VII. Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.

VII. Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.

IX. General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluviated areas sand and mud ejected, earthquake fountains, sand craters.

X. Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.

Definitions of Masonry

A. Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.

B. Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces.

C. Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces.

D. Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

* Intensity scale published in Richter, C. F., Elementary Seismology, Wilt Freeman & Co. Inc., 1958.

Fatalities and Injuries

Of the more than 5 million persons in the Bay Area, more than 4.9 million are uninjured as of D+7, as shown in Table 2. The fatalities and injuries are as follows:

Fatalities	10,370
Reported missing	1,625
Injured, requiring hospitalization	29,560
Extensive (30 days or more)	8,870
1 to 2 weeks	20,690
Injured, requiring outpatient care	27,740

The heaviest casualties are in Alameda, San Francisco, San Mateo, and Santa Clara Counties--85% of the fatalities and 81% of the injured requiring hospitalization or outpatient care.

Under the direction of the 6th U.S. Army, most of the bodies are in storage in refrigerated Fleet Support Ships at Hunters Point; about 3,000 have not been identified. Bodies are still being uncovered as of D+7. About 10% of the casualties have been moved southward out of San Francisco County and eastward out of western Alameda and Contra Costa Counties because of the extensive damage to hospitals and related facilities. More than one-half of the hospital beds in the area were lost, including about 70% in San Francisco, San Mateo and Santa Clara Counties. As of D+7, 3,000 emergency hospital beds (Package Disaster Hospital units and Hospital Reserve Disaster Inventory modules) have been set up, primarily in school gymnasiums. In addition, emergency care and first aid facilities have been set up in areas most severely affected by the disaster. However, medical supplies and equipment are in extremely short supply.

Most medical personnel are available for duty by D+7, ranging from 94% to 98% in the Bay Area counties. Detailed information on where they are assigned and whether or not they are working full time is not available. Reports from the field indicate that there is a severe shortage of both hospital beds and medical personnel.

Table 2

Fatalities and Injuries as of D+7

	Projected* 1979 Population Prior to Disaster	Reported Fatalities as of D+7 Days	People Reported Missing as of D+7	Survivors Requiring Extensive Hospitalization 30 days	Survivors Requiring 1 to 2 weeks additional Hospitalization	Ambulatory Casualties Requiring Out Patient Care	No Given First Aid but now OK	Total Surviving Population 1-(2+3)	No. Uninjured as of D+7 8-(4+5+6)
Alameda	1,113,000	2,700	600	2,070	4,830	6,760	60,750	1,109,700	1,096,040
Contra Costa	631,000	800	80	750	1,730	2,400	21,700	630,120	625,240
Marin	226,400	500	70	420	980	1,360	12,200	225,830	223,070
Napa	96,900	10	5	10	20	30	250	96,885	96,825
San Francisco	659,900	2,000	400	1,950	4,550	5,540	49,700	657,500	645,460
San Mateo	583,100	1,200	150	1,070	2,500	3,300	29,800	581,750	574,880
Santa Clara	1,233,100	2,600	250	2,080	4,870	6,700	61,100	1,230,250	1,216,600
Solano	215,700	80	10	100	230	150	1,300	215,610	215,130
Sonoma	271,600	480	60	420	980	1,500	13,400	271,060	268,160
Totals	5,030,700	10,370	1,625	8,870	20,690	27,740	239,220	5,018,705	4,961,505

* Source: Association of Bay Area Governments (ABAG) Projections 79, 1980-2000; Berkeley, California, April 1979; National Oceanic and Atmospheric Administration (NOAA), "A Study of Earthquake Losses in the San Francisco Bay Area," prepared for the Office of Emergency Preparedness, 1972; SRI International.

Damage to Buildings

Dwelling Units

Of the 1.9 million predisaster dwelling units in the Bay Area, more than 1.8 million are habitable as of D+7 but most require minor repairs (Table 3). Damage to dwellings is estimated to be as follows:

Destroyed	9,930
Must be demolished	4,760
Require extensive repairs	28,320
	42,920

The heaviest damage is in San Francisco, San Mateo, and northern Santa Clara Counties.

There are about 38,000 homeless as a result of the earthquake and more than 70,000 are living in heavily damaged homes. Few of the homeless have left San Francisco; about one-half have moved in with friends and relatives, and the rest are in emergency-care shelters set up by the city.

The process of identifying structurally unsound dwellings is still under way by the U.S. Corps of Engineers and local public works personnel. Procedures for demolishing these buildings have not yet been initiated.

Industrial and Commercial Buildings

As of D+7, a complete inventory of damage to industrial and commercial buildings has not been completed. However, many of the industrial and commercial areas are located on structurally poor or fill land or within a few miles of the San Andreas Fault in the built-up areas indicated in Figure 1.

Preliminary data indicate that about 5,000 buildings have collapsed or are so severely damaged that they require demolition. They are distributed as follows:

Table 3

DWELLING UNITS LOST AND NUMBER OF HOMELESS

	Predisaster Dwelling Units*		Number of Family Homes		Number of Multiple Dwelling Units		Number of Dwelling Units		Number of People	
	Single Family	Units in Multiple Dwellings	Destroyed	Requiring Demolition	Destroyed	Requiring Demolition	Requiring Extensive Repairs	Livable With Minor Repairs	Longterm Homeless*	Living in Damaged Repairable Homes
Alameda	262,120	164,200	200	150	280	140	1,540	424,010	2,170	4,400
Contra Costa	182,900	46,750	20	10	50	30	220	229,320	340	700
Marin	62,710	22,050	50	30	130	60	470	84,020	760	1,400
Napa	30,820	5,270	10	10	20	10	80	35,960	100	200
San Francisco	103,100	200,900	1,400	600	4,000	2,000	15,400	280,600	18,400	35,600
San Mateo	156,880	60,440	800	350	1,700	800	7,040	206,630	10,600	20,600
Santa Clara	316,200	122,730	400	200	700	300	3,000	434,330	4,900	9,400
Solano	59,230	18,900	15	5	15	5	80	78,010	100	200
Sonoma	90,070	13,700	40	20	100	40	400	103,170	540	1,000
Total	1,264,030	654,940	2,935	1,375	6,995	3,385	28,230	1,876,050	37,910	73,500

* Does not include hospitalized survivors from Table 1.

Sources: NOAA (see Table 2), SRI International

County	Number of Buildings
Alameda	500
Contra Costa	50
Marin	100
San Francisco	2,500
San Mateo	1,100
Santa Clara	500
	4,750

As was the case for residential buildings, the most severe damage is in San Francisco, San Mateo, and Santa Clara Counties. There is also considerable damage in Alameda County because of the concentration of industrial and wholesaling activities on structurally poor or fill land. An additional 5,000 buildings have suffered moderate to heavy damage but can be repaired.

Public Buildings

Because of the concentration of federal regional activities in San Francisco, most buildings housing federal agencies sustained severe damage; some 20 locations, most of them in San Francisco, are affected. Information on state and local government buildings is not complete, but damage is expected to parallel that for industrial and commercial buildings. School buildings, however, survived for the most part, with minor structural damage but with widespread and extensive window breakage.

Damage to Transportation Facilities

Tables 4, 5, and 6 summarize the damage to major highways, public transit and airports. In general, damage is severe, requiring months to years for repair or reconstruction.

Highway transportation has been severely affected (Table 4). Elevated portions of intercity routes and overpasses have collapsed or been damaged,

TABLE 4

CONDITION OF INTERCITY ROUTES AT D+7

	COLLAPSED OR EXTENSIVELY DAMAGED	ACCESSES COLLAPSED OR NOT USABLE	OVERPASSES COLLAPSED OR NOT USABLE	OVERPASSES DAMAGED BUT NOT COLLAPSED	LIQUIFICATION OR SECTIONS UNDER WATER	DAMAGED BUT USABLE	OPERATIONAL	YEARS TO REPAIR	NO. OF VEHICLES ABANDONE
ROUTE 101: Bayshore Freeway								3 to 5	2500
Elevated Portions	X	X							
Candlestick Pk. to San Bruno	X				X				
Oyster Pt. to Marsh Rd.	X								
San Mateo to Palo Alto	X		X						
Portions between P.A. & Rte. 17									
San Jose Southward						X	X		
ROUTE 280: Junipero Serra Freeway								3 to 5	2500
Across S.F. elevated/accesses	X		X						
Daly City, South S.F., San Bruno	X		X						
Rte. 92 North to 280			X						
Rte. 84 & Page Mill Rd. South of Rte. 92			X						
Page Mill South to Rte. 17 (damaged to Stevens Creek Pkwy)				X					
ROUTE 17: NIMITZ FWY.									15000
San Jose North to San Leandro	X								
98th Ave. North to Rte. 80			X						
Streets between Rte. 17 & Bay					X				
Webster & Posey Tubes		X							
Rtes 80, 17 from Bay Bridge to El Cerrito					X				
From El Cerrito West to Bay					X				
Richmond north Rte 80							X		
ROUTE 82: EL CAMINO REAL							X		
NORTH-SOUTH AND WEST to EAST STREETS							X	2	

TABLE 4 (Concluded)

CONDITION OF INTERCITY ROUTES AT D+7

	COLLAPSED OR EXTENSIVELY *DAMAGED*	ACCESSES COLLAPSED *OR NOT* USABLE	OVERPASSES COLLAPSED *OR NOT* USABLE	OVERPASSES DAMAGED *BUT NOT* COLLAPSED	LIQUIFICATION OR *SECTIONS* UNDER WATER	DAMAGED BUT USABLE	OPERATIONAL	YEARS TO REPAIR	NO. OF VEHICLES *ABANDONED*
MARIN COUNTY									
Route 101 from Santa Rosa South (landslides)	X		X					2	
Route 1 (faulting & landslides)	X								
Route 37 at Northern end of Bay between Routes 80 & 101	X				X				
Solano, Napa & Sonoma Cities roads/highways							X		

Sources: NOAA (see Table 2); SRI International

TABLE 5

CONDITION OF PUBLIC TRANSPORTATION AT D+7

	CONSIDERABLE DAMAGE INCL. LIQUIFICATION	NOT IN OPERATION	SERVICE WILL BE RESTORED
BART			
S.F. Area	X		In several months
Elivated areas in Oakland	X		
BUS SERVICE			
San Jose/Santa Cruz to Bay		X	
West of Rtes. 17 or 80 to East Bay		X	
STREET CARS, S.F.	X		In several months
RAILROADS			
Watsonville to S.F.	X	X	3 to 6 months
Santa Rosa to Marin	X	X	

TABLE 6

CONDITION OF AIRPORTS AT D+7

AIRPORTS	BUILDINGS COLLAPSED OR EXTENSIVELY DAMAGED	OVERPASSES COLLAPSED	ACCESSES COLLAPSED	RUNWAYS DAMAGED OR UNDER WATER OR LIQUIFIED	AIR NAVIGATION AND TRAFFIC CONTROL FACILITIES DAMAGED	OPERATIONAL	TO RESTORE
SAN FRANCISCO INTERNATIONAL	X	X	X	X	X		1/2 to 1 years
OAKLAND INTERNATIONAL Helicopters using fields	X		X	X	X		Single engine planes can use in 1 week; 4 engine planes in 1 month
ALAMEDA NAS				X			1/2 year
MOFFETT NAS	X			X			1/2 year
SAN JOSE MUNICIPAL	X			X			2 Weeks
FT ORD AIR STRIP						X	
Crissy Field (Presidio)	X						Operational only for helicopters at D+7

Sources: NOAA (see Table 2); SRI International

particularly in San Francisco and Oakland, but also in other areas. Liquefaction or flooding also has damaged parts of the Bayshore and Nimitz freeways. In addition, the approaches to all major bridges (except the Carquinez and Martinez bridges) have collapsed or are badly damaged. Most streets within cities, particularly San Francisco and Oakland, are blocked because of debris and abandoned vehicles. No steps have been taken to dispose of debris although at least one street has been cleared to each section of San Francisco and Oakland. Access to the piers in these cities has not been possible.

As of D+7, north-south traffic routes have been established in Marin County and east-west routes around the northern and southern ends of the bay. Road transportation elsewhere is severely constrained.

As of D+7, there is limited public transportation in operation because of extensive physical damage to the railroad, BART, and streetcar systems (Table 5). Limited bus service could be established, but schedules have not been prepared.

None of the commercial airports in the area is operating because of extensive runway damage, flooding and building damage (Table 6). Of the military facilities, only Hamilton AFB (now inactive) and Fort Ord Air Strip are undamaged. Except for San Francisco International, all airports can be opened for limited use (helicopters and small planes) in a few weeks and four-engine-plane use in 2 to 4 weeks. Some improvisation will be required to meet this timetable; restoration to original condition will take longer in most cases.

Damage to Utilities

Figure 4 shows the major aqueducts, reservoirs, sewage treatment plants, and outfalls. Although there were no reservoir failures in the Bay Area, evacuations were necessary because of leakage or weakening of the following:

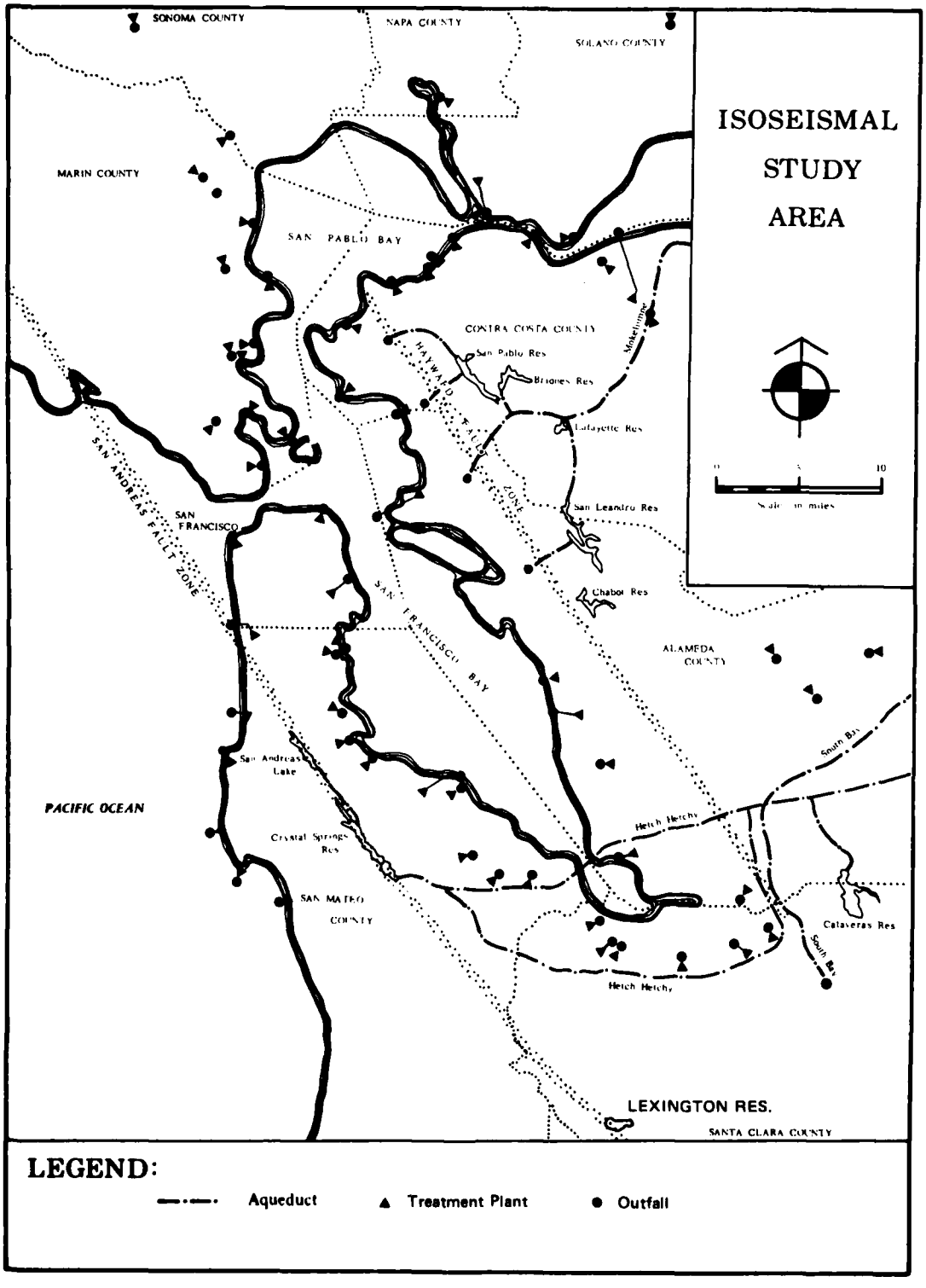


FIGURE 4 SEWAGE TREATMENT PLANTS AND OUTFALLS, AQUEDUCTS AND RESERVOIRS

Dam	Problem	People Evacuated
Crystal Springs	Leakage	20,000
Lexington	Leakage	10,000
San Leandro	Weakening	25,000
Chabot		

The major aqueducts have survived. City water mains in the West Bay have also survived, except in areas of structurally poor ground bordering the bay and in areas of extensive surface faulting (Daly City, South San Francisco and San Bruno). In the East Bay major problems exist in the areas west of Highway 17. In areas short of water, deliveries by tanker truck are being made.

Damage to sewer systems is comparable to that done to water lines, being concentrated in areas of poor ground and surface faulting. Twenty-five of the approximately 40 sewage treatment plants built on fill land around the bay are severely damaged. Open trenches are being dug to the bay to accommodate about two-thirds of the sewage produced in San Francisco, San Mateo, and Santa Clara Counties and about one-fourth of that produced in Alameda and Contra Costa Counties.

Figure 5 shows the major natural gas and electric power facilities in the area affected by the earthquake. Damage to these utilities is extensive. As of D+7, there is no electric service in the West Bay counties and Marin County, except for facilities with emergency generators. In the East Bay, service is available to most areas east of Route 17 and to selected areas west of the highway. Transmission lines have broken along both sides of the bay because of ground failure, with problems concentrated in the same distribution areas as those of the water system. About 30 days will be required to restore service to San Francisco, San Mateo, and northern Santa Clara Counties and to the portions of the East Bay west of Route 17; service to other areas is expected within 2 weeks.

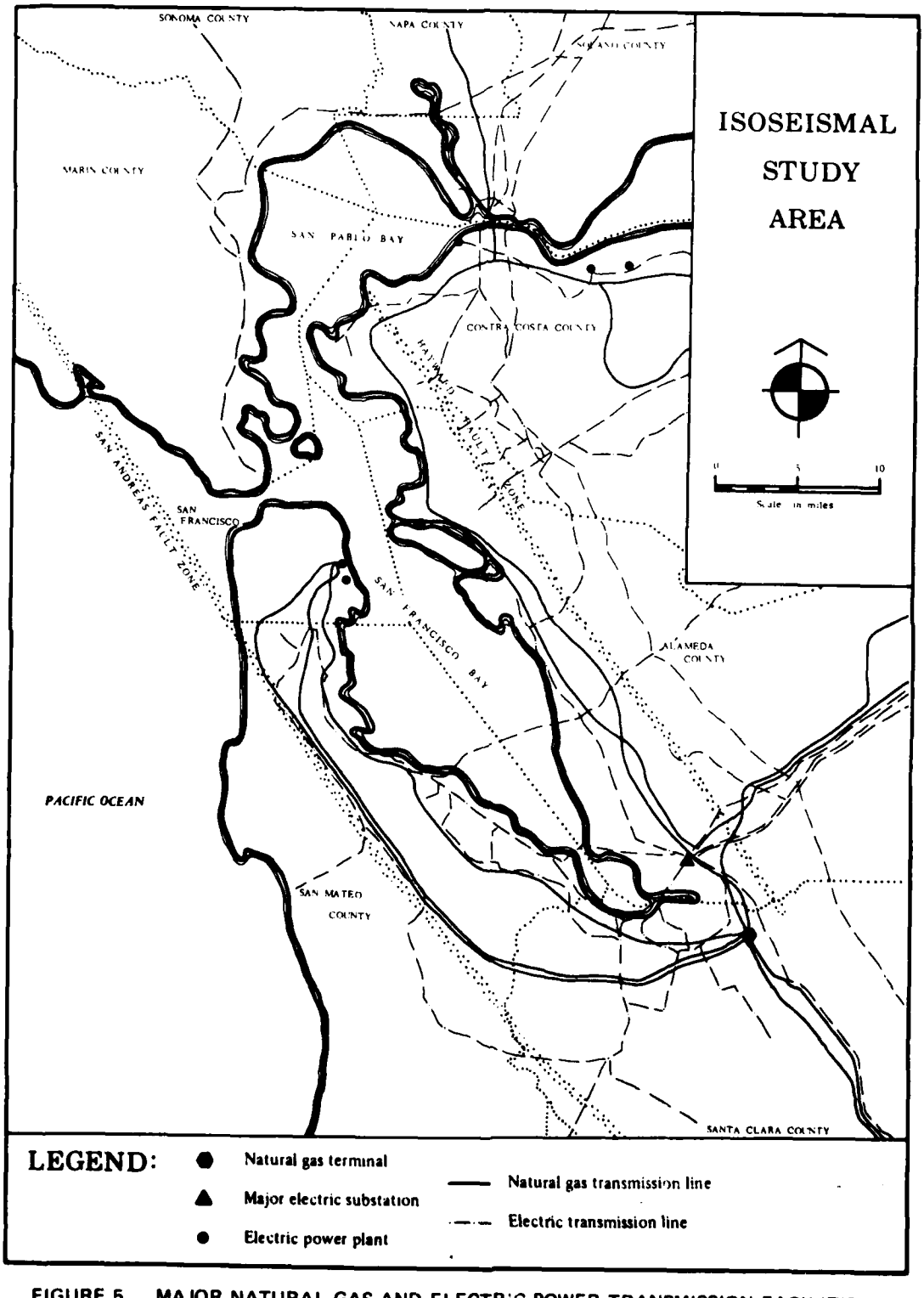


FIGURE 5 MAJOR NATURAL GAS AND ELECTRIC POWER TRANSMISSION FACILITIES

About 75% of the telephone system is out in San Francisco, San Mateo, and Southern Marin Counties; about 25% is out in the other counties. Two to four weeks will be required to restore service to most areas.

Situation Summary

The preceding section provided information on fatalities, injuries, and physical damage in the Bay Area. A summary of the primary actions that have been taken during the first week to restore services is provided below:

- Because of the magnitude of the disaster, the immediate rescue and life-saving actions took place primarily through mutual aid among the affected people. However, federal, state, and local EOCs (Emergency Operating Centers) were activated early during the first day (although staffing was not complete), and by D+7 the immediate life-saving and survival problems are under control.

- During D+1 through D+3, thousands of people trapped on the Golden Gate and Bay Bridges and in stalled and jammed elevators were rescued.

- Emergency care and first aid facilities have been set up in San Francisco, San Mateo, northern Santa Clara, western Alameda and Contra Costa, and southern Marin Counties. Approximately 10% of the casualties have been moved southward out of San Francisco County; 25% have been moved eastward out of western Alameda and Contra Costa Counties. The remaining casualties are hospitalized in improvised emergency facilities. There are acute shortages of medical supplies, equipment, and personnel.

- Search and rescue operations are continuing. Bodies are still being uncovered as debris is cleared; others are being found in the bay.

- All urban fires have been extinguished, and a major federal, state, and local effort is under way to control forest/brush fires in Marin County and to extinguish them in San Mateo and Santa Clara Counties.

- Very few of the homeless have left San Francisco as of D+7. It is estimated that about 10% of the homeless in Alameda County have moved in with friends or relatives (east of Route 17) whose dwellings have survived.

- Emergency feeding and mass-care shelters for the homeless have been opened and are operational in San Francisco, San Mateo, northern

Santa Clara, western Alameda and Contra Costa, and southern Marin Counties.

- Food was furnished without charge in minimum amounts from local requisitioned supplies made available by local government during the first three days for all families in the six-county area whose home supplies were exhausted. As of D+4, retail food outlets, which were relatively undamaged, were reopened for the sale of canned and dried foods, but sales were limited to $15 per purchase. At D+4, generally no fresh meat, dairy products, or fresh fruits and vegetables are available as yet because of lack of electricity and refrigeration. Also at D+4, pharmacies, which were relatively undamaged, were reopened for the sale of medicine, drugs, and first aid supplies. Medicines requiring refrigeration are generally not available at these stores as of D+7.

- Gasoline sales have been restricted to emergency vehicles only in San Francisco, San Mateo, northern Santa Clara, southern Marin, and western Alameda and Contra Costa Counties. Most filling stations are not yet in operation in these areas because of lack of commercial power.

- Banks still have not opened as of D+7 in San Francisco, San Mateo, northern Santa Clara, southern Marin, and western Alameda and Contra Costa Counties.

- Emergency telephone service has been restored to essential government facilities as of D+7. Most radio stations with emergency generators are in operation as of D+7, with a minimum of two operational in each county. There has been regular EBS (Emergency Broadcast System) programming coordinated by the State Regional EOC at Concord since about 2 hours after the earthquake.

- At local government requests from Marin, San Francisco, San Mateo, Santa Clara, Contra Costa, and Alameda Counties, the Governor made elements of the State National Guard available at D+1 to assist local police with law enforcement. As of D+7, the National Guard is still assisting local police in this effort. Guardsmen are also assisting the guards at San Quentin Prison because of collapse of one of the prison walls and damage to buildings there.

- At the request of the Governor, federal military police have been made available from Fort Ord and Fort Lewis to assist state and local police in perimeter access control and in directing traffic. Perimeter access control has been set up at all access roads to keep the curious and sightseers out of San Francisco and San Mateo Counties, northern Santa Clara County, southern Marin County, and west Contra Costa County. There has been no declaration of martial law because, as of D+7, the need has not become apparent.

- Air traffic control in and out of the disaster area has been maintained by the FAA from its facilities outside the greater Bay

Area. International traffic normally scheduled into the area is being rerouted to Los Angeles, Seattle and Chicago. Domestic traffic is being routed into Sacramento, Fresno, and Reno.

- From D+1 forward, state National Guard helicopters were made available by the Governor to assist in all appropriate survival and recovery missions. Helicopters have also been made available by the FEMA (Federal Emergency Management Agency) through DOT (Department of Transportation), in response to state OES (Office of Emergency Services) requests for such support.

- Debris clearance was initiated at D+4; but as of D+7 this effort is barely under way, and millions of tons of debris as well as hundreds of thousands of uprooted trees must be removed. Buildings are still being inspected and, if required, marked for demolition; procedures have not been established to accomplish the necessary demolition.

III RECONSTRUCTION ISSUES REQUIRING MULTIJURISDICTIONAL DECISIONS

The immediate concerns of public and private sector leadership, quasi-public organizations, and individuals, both in the area affected by the disaster and in other areas with available resources, relate to life-saving and support activities and the rapid restoration of emergency services, at least on a temporary basis. Once these needs have been met, attention can be focused on reconstruction, although continuing activities of an "emergency" nature will be required for an indeterminate period.

A wide variety of issues requiring multijurisdictional decisions has been identified. They are described in detail in Appendix B, and are summarized below under the following general categories:

- Reconstruction Policies and Priorities
- Leadership Roles
- Coordination of Critical Emergency Services
- Transitional Governance
- Phasing of People-Serving Activities
- Physical Reconstruction Activities.

Decisions will be difficult because of the fragmented character of local government and the many federal and state agencies and private-sector entities that should be involved in the reconstruction effort. The complex public-sector/private-sector interrelationships are described in Appendix C.

Reconstruction Policies and Priorities

The reconstruction effort will require financial and physical resources well beyond the capabilities of the affected area. It is critical that goals be set to guide reconstruction activities and priorities be established for allocating the local resources and those provided from outside the area. This should be done as soon as possible after immediate needs have been met, if changes in land use and building code provisions are contemplated.

The major policy issues relate to the delineation of set-aside areas based on seismic risk (from liquifaction, landslides, or faulting), the modification of building codes to reduce earthquake vulnerability, and the selection of procedures for implementing such policies. Once the guiding policies have been agreed on--with inputs from federal, state and local governments, the private sector, public interest groups, and local residents--the difficult problem of establishing priorities for the massive reconstruction effort needs to be addressed. Priorities should reflect the area-designation guidelines and such considerations as the need to restore basic utilities, the desirability of reestablishing industrial/ commercial activities (and the associated employment and income) as quickly as possible, and the need to allocate limited resources among competing demands in an equitable fashion.

Leadership Roles

Because of the extensive and widespread damage and the need for coordinated inputs from all levels of government, the private sector, a variety special-purpose organizations, and individuals, it will be important to establish leadership roles early in the recovery period. Of particular importance will be the responsibilities for overall leadership of the reconstruction effort, for development of a coordinated, multijurisdictional land use plan and standardized building code regulations, for facilitating the

provision of assistance through established government programs, for modifying program requirements and other regulations to ensure rapid responses, and for mobilizing the rather fragmented private sector resources according to the established priorities.

In practice, the leadership requirements will differ from those characterizing normal conditions. A regional approach is needed, involving the coordination of diverse functions and the allocation and scheduling of resource use without regard to political boundaries.

Coordination of Critical Emergency Services

Critical to the maintenance of societal order is the continuation of emergency services, particularly law enforcement, medical care, disposition of the dead, and care of those without adequate resources or housing. These and other activities of an emergency nature will be operating by the end of the first week after the disaster, and must continue as long as needed. They require the coordinated effort of all levels of government, quasi-public entities, and some segments of the private sector. Their effectiveness can be enhanced by a comprehensive, coordinated public information system, with major responsibility for its operation at the local level. As the reconstruction effort progresses and predisaster functions are reestablished, these emergency activities can be phased out.

Transitional Governance

With critical emergency functions being handled jointly by several levels of government, local jurisdictions will begin to reestablish their pre-disaster organizational structure and functional activities. The objective of these jurisdictions is to facilitate the transition from the existing emergency posture to "normal" conditions. Some of the transitional functions, such as assisting in the resolution of logistic problems associated with emergency activities, in the use of available labor, and in the

administration of rationing and control programs, differ from normal functions, but will be important responsibilities of local governments, at least in the early stages of reconstruction.

For some of these governments, return to the predisaster situation may be difficult or in some cases impossible. Extensive damage, the establishment of large set-aside areas, and the resulting loss of tax base may force consideration of changes in local government structure to reflect the new post-disaster situation.

Phasing of People-Serving Activities

People-serving activities, such as banks, retail and wholesale establishments, and other private sector activities, as well as such broad-based public sector facilities as schools, *need to be made* operational as soon as possible, both to provide employment and to facilitate the return to normal conditions. In severely-damaged areas, a coordinated approach--at least by the major chains or branch operations--may be necessary to provide relatively rapid restoration of service without overtaxing available construction, transportation, or other resources. With respect to schools, some consolidation of systems may be required because of structural damage to some facilities and the use of others for emergency medical, feeding and housing purposes.

Physical Reconstruction Activities

Within the framework of priorities established for the reconstruction effort, there are numerous special problems that need resolution if resources are to be used efficiently. In practice, for extensively damaged areas, detailed scheduling of construction activities may be required, covering building demolition, debris clearance, and restoration of essential service facilities, transportation networks, government buildings, dwellings

and commercial/industrial structures. Decisions will have to be made regarding the extent to which the scheduling is centralized or conducted on a regional basis and the nature of the involvement of general contractors, special trade contractors, unions, and the several levels of government in this process.

IV A SIMULATION EXERCISE

Section III and Appendix B provide a description of the major issues involving multiple jurisdictions that would require resolution before the initiation of significant recovery/reconstruction efforts following a major earthquake. The multiplicity of publicand private-sector entities that will need to play a role of one type or another in these efforts is outlined in Appendix C.

Many of the issues are complex and controversial, and have not been addressed adequately in previous disaster planning and research. The use of a simulation exercise, as described in this section, is regarded as an effective means of assisting local leaders in and out of government, and representatives of higher levels of government who will be directly involved with local issues, to understand the reconstruction problems they may have to face and the decisions that may have to be made. This understanding is valuable in itself but may, in addition, encourage advance joint planning, if only to facilitate the decisionmaking that would be required in the event of disaster.

The concept of the simulation exercise is outlined below, followed by a description of its essential elements. The outputs expected from implementation of the exercise are then discussed.

Concept of the Simulation

The simulation is designed to test three sets of multijurisdictional relationships:

- Federal/state interactions in setting reconstruction goals and priorities and establishing a workable mechanism for effective utilization of available resources.

- Federal/state/local interactions in setting regional priorities and establishing reconstruction guidelines.

- Local (city/county/private-sector) interactions in obtaining consensus regarding regional guidelines and in preparing for their implementation.

These are critical elements in the organization of a reconstruction effort. Because major assistance--both financial and "in kind" will be coming from federal and state sources, it is necessary to reach early agreement on priorities and on procedures to ensure equitable allocation of assistance. Furthermore, because of the massive damage and the multiplicity of public and private entities affected, regional decisions need to be made with input from, and ultimately the agreement of, local governments.

In practice, a series of simulations would be required to cover the entire set of interactions preceding the establishment of a coordinated reconstruction program. These interactions could include, for example:

- A meeting called by the Governor to plan for initiation of reconstruction efforts in the Bay Area. Participants would include the relevant state departments, FEMA, 6th Army, the Federal Regional Council, Association of Bay Area Governments, and a limited number of private-sector representatives. The purpose would be to set goals and priorities and to organize an agenda for and plan the participation in a regional meeting to be attended by federal, state, and local government representatives.

- Local city council (or board of supervisors) meetings to assess reconstruction requirements and determine strategy to be followed at the regional meeting or at later meetings to discuss regional decisions. Such meetings would be held in all communities affected by the disaster, although not all would be represented at the first regional meeting.

- A regional meeting chaired by the California Office of Emergency Services (OES) and including appropriate federal and state officials and selected local government representatives. This is an important element in the simulation because regional problems will have to be faced and discussed and priorities set at a forum where most governmental interest groups are represented.

- Local meetings to assess the decisions (or compromises) made at the regional meeting. These could be of two types: meetings with local leaders who did not participate in the regional meeting to obtain their reaction and inputs; city council (or county board) meetings to report on and get reactions to the regional decisions and priorities.

- Additional regional meetings to assess earlier decisions in the light of subsequent reactions and to attempt to reach a consensus on goals and priorities and on administrative procedures to be followed during the reconstruction period.

Although the long-term objective of the recovery effort is to facilitate the return to predisaster socioeconomic and institutional conditions, the severity of the damage and the magnitude of outside (state and federal) assistance required necessitate the type of participation outlined above. It will be essential to set goals and priorities for allocation of federal and state aid and for coordination of non-government inputs early in the recovery process. An administrative mechanism will be required to implement them and to avoid a scramble for assistance by the multiplicity of public and private entities in the Bay Area directed at the many state and federal agencies with assistance programs.

The meetings outlined above are designed primarily to address these issues. State and federal officials need to reach tentative agreement on goals and priorities before the extensive involvement of local government officials. A manageable regional meeting, with procedures for dissemination of recommendations and involvement of all local entities in ultimate policy decisions, is also important; provision is made for representation of the cities and counties of the Bay Area. The regional meeting is chaired by OES because of its role in coordinating the provision of emergency services and the need to provide an effective transition from emergency response to recovery as well as a direct link to state and federal agencies. Existing regional agencies such as ABAG and the Bay Conservation and Development Commission (BCDC) are represented, but are not appropriate to chair the regional meeting. The former is a voluntary organization concentrating on planning for the Bay Area but with no implementation authority; not all units of government are members. BCDC, which has the authority to enforce land use decisions, has limited geographic jurisdiction.

It does not appear to be practical to conduct the entire series of simulations, not only because of the expense but also because of the time required of participants. Consequently, the simulation described in detail below is designed to incorporate three critical elements: a state/federal meeting, a regional meeting, and a local meeting. Both regional and local meetings can be replicated, if found to be useful training devices, or the experience from the three-element simulation can be used to prepare reconstruction planning guidelines.

Simulation Procedures

Procedures for conducting the three simulation elements will be similar in that each will begin with a briefing to acquaint the participants with the sequence of events since the disaster and to explain the purpose of the meeting, followed by a relatively free-flowing (but guided) discussion of issues. However, the perspectives of the participants differ, and the agendas and expected outputs vary. The specific procedures are discussed below.

State Meeting Simulation

Purpose of the Meeting

The simulation meeting is the first meeting after the disaster that involves both federal and state representatives in the specifics of planning for reconstruction. They have been involved in the immediate response/recovery activities, and state and federal coordinating officers are collocated to facilitate the recovery process. But to date, long-term goals have not been set, nor have priorities for allocating assistance or the formal mechanisms for doing so been established.

The meeting is called by the Governor not only to establish a strong leadership role for the state but to ensure that the short-term approaches

suitable for immediate response are not locked into the recovery process (unless appropriate). The specific objectives of the meeting are to:

- Exchange information on current conditions and urgent needs in the Bay Area.
- Establish reconstruction goals and set priorities for allocation of resources.
- Agree on administrative procedures for implementation of priorities and allocation of resources.
- Establish an agenda for the regional meeting, including federal and state roles, issues to be presented, sequence of discussion, and expected outputs.

Participants in the State Meeting

For this first meeting, participation will be limited to permit frank discussion of options and development of an initial consensus on required implementation procedures. The following will be included:

- The Governor (or designate).
- Director, Office of Emergency Services.
- State Coordinating Officer (or proxy).
- Heads of relevant state departments, e.g., health and welfare, transportation, economic development.
- Regional Director, FEMA.
- Federal Coordinating Officer.
- Representative, 6th Army.
- Representative, Federal Regional Council.
- Representative, Association of Bay Area Governments.
- Representative, California Roundtable or other business organization.

Agenda for the State Meeting

The following items constitute the agenda:

A. Introduction of attendees: Governor (or designate).

B. Statement of purpose: Governor (or designate).

- Basic objectives
- Issues to be discussed
- Outputs expected

C. Descripription of current conditions and activities: state, federal, ABAG, and private sector representatives.

D. Discussion of reconstruction guidelines:

- Reconstruction goals
- Priorities for allocation of resources
- Implementation procedures

E. Preparation of an agenda for the regional meeting.

Item D of the agenda will be guided by a draft State/Federal Reconstruction Guidelines prepared by the Office of Emergency Services at the Governor's request. This document, as modified at this meeting (and subsequent meetings if required) is expected to be incorporated into the California Earthquake Response Plan and the Federal Plan for Earthquake Response and Assistance (San Francisco Bay Area). A first draft of such a document is included in this report as Appendix D.

Guidelines for Conduct of the Simulation

The simulation will take a full day and will consist of two parts:

- Briefing of participants--a 2-hour morning session
- Meeting of participants--a 2- to 3-hour afternoon session.

The morning meetings will be conducted by staff of the organization directing the simulation, the afternoon meeting by the Governor (or designate).

The briefing will include a description of the disaster scenario* and a discussion of the roles, programs, and objectives of each participant group. To ensure that the afternoon meeting will be as realistic as possible, separate briefings should be held for state representatives, federal representatives, ABAG, and industry, at least with respect to issues of particular concern to each group.

The afternoon meeting should be free flowing but with firm direction from the chair. There will be an observer from the organization conducting the simulation; and staff of that organization will provide some outside inputs reflecting messages from persons or groups not represented and wanting to be heard, response-type issues requiring immediate decisions by participants or other disruptive factors.

In some ways, this type of simulation will be less stressful than simulations of the immediate response periods following a disaster, when requests for assistance may exceed response capabilities. However, stress will result from realization of the magnitude of the disaster and from the potential conflicts associated with the setting of priorities and the establishment of workable administrative procedures. It will be the responsibility of the chair to insist on decisions or at least agreement (to agree or disagree) on the goals, priorities, and implementation procedures to be presented at the regional meeting.

Regional Meeting Simulation

Purpose of the Meeting

This meeting constitutes the second step in initiating a comprehensive coordinated reconstruction program for the San Francisco Bay Area. The first step was the state meeting, described above, at which, hopefully,

*A briefing booklet that could be used for this purpose would be prepared by the organization directing the simulation exercise.

consensus was reached on goals, priorities, and implementation procedures. Meetings concerned with reconstruction problems have also been held at county and city levels, but these have been concerned primarily with local rather than regional issues and with approaches to returning to normal.

The purpose of the regional meeting is to involve selected federal, state, and local officials and representatives of the private sector in the formulation of regional guidelines for reconstruction. Specific objectives of the meeting include:

- Review of goals and priorities developed at the state meeting and discussion of modifications proposed by participants.
- Assessment of the administrative mechanism proposed by state and federal authorities for allocating financial assistance and other resources.
- Adoption of tentative procedures to be used by local governments to facilitate the allocation of resources within their communities.
- Development of procedures for obtaining consensus among other local government entities with respect to goals and priorities.
- Development of procedures for optimal involvement of the public-sector, quasi-public organizations, and other organizations in the reconstruction effort.

Participants in the Regional Meeting

Participants will include those who participated in the state meeting, plus the following representatives of local government:

- Counties: chairmen of the Boards of Supervisors of Alameda, San Mateo and Santa Clara Counties.
- Cities: Mayor of San Francisco and chairmen of the Council of Mayors of each county.
- Bay Area Council: chairman of the Board of Directors.

Agenda for The Regional Meeting

A. Introduction of attendees: Governor (or designate).

B. Statement of objectives and expected outcomes of meeting: Governor (or designate).

C. Review of reconstruction guidelines: Director, OES, and Regional Director, FEMA.

- Goals and priorities.
- Administrative procedures.

D. Development of tentative local government procedures for allocation of assistance.

E. Development of programs for:

- Involving other local governments.
- Involving other organizations.

It is important that the leadership role of the state be strongly defined: the Governor (or his designate) should lead Item B to emphasize the critical nature of this meeting. The balance of the meeting should, in a real disaster situation, be co-chaired by the State Coordinating Officer and the Federal Coordinating Officer to reflect the consensus reached on federal/state support of reconstruction. For the simulation the Director of the California OES and the Regional Director of FEMA could act as co-chairmen. Because of the complexity of the issues and the large number of government and nongovernment agencies and organizations with a stake in the policies contained in the reconstruction guidelines, participation in this first regional meeting is kept small. Agenda Item E, therefore, is critical because broad-based agreement on goals and priorities and willingness to work within the established procedures are required if an effective reconstruction effort is to be mounted.

Guidelines for Conduct of Simulation

As in the case of the state meeting, the simulation exercise will include a briefing of participants before the meeting and the meeting itself. It is expected that a full day will be required for the meeting;

briefings of participants should be scheduled for the evening of the preceding day.

Although those who attended the state meeting do not require a complete briefing, a review of policy positions, roles to be played in the regional meeting, and other factors would be appropriate (and may well reflect actions that would be taken under real disaster conditions). The representatives of local government would be briefed on the disaster scenario, with additions to emphasize specific local detail as appropriate. The remainder of the briefing will focus on local issues and concerns that will need to be aired at the regional meeting.

The meeting should be free flowing but held within the agenda. The importance of strong leadership by state and federal participants was referred to above. But it is equally important that local needs be recognized and that the difficult problems of setting priorities, allocating aid and managing the reconstruction effort in a multijurisdictional context be thoroughly discussed. The active participation of all attendees will be necessary to expose areas of potential conflict and to provide a basis for establishing regional policies.

Because of the limited representation of the many local stakeholders (and their varying legal status), many decisions made at the regional meeting can be regarded only as tentative, subject to extensive review and establishment of consensus (and, in some cases statutory amendments). The output of the meeting must also include suggested procedures for taking this next step.

City Meeting Simulation

Purpose of the Meeting

This is a simulation of the first meeting to be called in the city following the disaster that has the specific purpose of initiating planning

for the reconstruction of the city. Two particular activities prompt the Mayor to call the meeting. One is a growing series of visits and occasional telephone calls from private-sector officials, city officials, and other citizens asking for decisions needed before rebuilding can occur--for example, assurance that a certain road will be rebuilt or that a building permit will be issued. The second prompting event is a meeting held the previous day, sponsored by the Governor, at which federal, state, and local officials in the region discussed reconstruction issues, including goals, priorities, and administrative procedures for organizing a coordinated reconstruction effort.

The Mayor wishes to inform leaders of the outcome of the regional meeting, to define the issues, to reach conclusions where possible, to establish a procedure for reaching additional conclusions later, and to decide what further steps should be taken to obtain assistance from state or federal agencies or other jurisdictions in the region.

Participants in the City Meeting

The meeting is attended by persons invited by the Mayor. Participants are:

- The Mayor
- A few city council members (less than a majority)
- The City Manager or Chief Administrative Officer
- Department heads, including:
  - Planning Director
  - Public Works Director
  - Transportation Director
  - Finance Director
  - Health Director
- Other community leaders, including:
  - An industrial leader
  - A commercial leader
  - A banker
  - A labor leader
  - A builder
  - An environmentalist
  - A spokesperson for the poor.

The public officials (with others such as the police and fire chiefs) have met several times to consider the immediate problems created by the disaster, such as fire and rescue operations, care of bodies, prevention of looting, restoration of utilities, clearance of streets, and provision of temporary housing. This is the first time these officials have met to discuss issues involving the more long-range reconstruction effort.

Agenda for City Meeting

A. Introduction of attendees: Mayor

B. Statement of meeting purpose: Mayor

C. Description of current conditions: City Manager

- Casualties, damage
- Current local activities
- Current state and federal activities

D. Presentation of reconstruction issues: Mayor

E. Discussion of reconstruction issues: Group

F. Conclusions for local action: Group

G. Further intergovernmental steps: Group

Guidelines for Conduct of the Simulation

Prior to the city meeting simulation, it will be necessary to brief the participants fully because it is unlikely that they will have actually experienced an earthquake of the magnitude in the scenario. The briefing will provide basic scenario background information on the events of the preceding 7 days and will encourage participants to raise issues needing review at the simulation meeting. A briefing booklet summarizing the scenario but including specific local detail will be used.

The first portion of the briefing will be for all participants. Then separate briefings will be held for (1) the Mayor, (2) the Chief Administrative Officer and the department heads, (3) the private-sector business and labor representatives, and (4) the public-interest representatives.

The briefing for all participants will consist of:

- Nature of the project
- Earthquake results
  - An overview
  - Casualties, damage
  - D+7 situation
- Purpose of the Mayor in calling the meeting
- Meeting agenda
- Desired outcomes.

The briefings for the four individual groups will relate to the role, programs, and objectives of each group and will stress the need to avoid being more conciliatory than participants would be in a real situation.

The meeting will be free flowing like the others. Again, it is important that attendees participate actively in order to clearly identify areas of conflict, particularly conflicts between city goals and priorities and those expressed in the guidelines developed at the state and regional meetings. Emphasis should be placed on defining a clear city position and on identifying the appropriate next steps.

Role of the Organization Directing the Simulation Exercise

The simulation exercise described in this section will require continuing input and guidance from an outside organization for several reasons:

- Briefings prior to the simulation meetings are critical to the success of the meetings and should be directed by professionals not connected with the participating entities. These persons will provide the background on the disaster and on the situation as of D+7, and will lead the discussions regarding agency/organization role, programs, objectives, and needs for assistance.

- Impartial observers are needed at each simulation meeting to note reactions and other subtleties that may not be apparent from the record.* Other staff will provide outside inputs to add reality and a sense of urgency to the meeting. The observers will also conduct a wrapup session after the meeeing to assess lessons learned and problems remaining unresolved.

The outside organization will prepare a report describing the simulation exercise, evaluating each meeting and recommending changes in the approach if required to improve the effectiveness of potential replications involving other local entities in the Bay Area or entities in other areas. The draft reconstruction guidelines will be revised to reflect the results of the simulations, for consideration by federal and state governments as inputs to existing guidelines.

Outputs expected from the Simulation Exercise

As has been indicated earlier, this is not a simulation designed to test specific operating systems--e.g., police, fire, emergency medical, communications--as is the case for a simulation of immediate response to disaster. It is designed to test relationships among governments and between government and nongovernment entities in the context of demands for services far in excess of those faced under normal conditions.

Since extensive planning effort has not been devoted to reconstruction after a major disaster, one output of the simulation will be an improved understanding of the multijurisdictional issues that will need to be faced and of the divergent views regarding alternative solutions to these issues. The confrontations inherent in the simulation approach will provide a more effective training mechanism than the seminar or workshop approach. The

*Meetings will be taped to provide an accurate record of the proceedings.

three-element simulation--particularly if the regional and local meetings are replicated--will extend this training to most of the important stakeholders.

In addition to enhancing understanding, the simulation can provide a basis for advance (predisaster) planning that could speed the initiation of a reconstruction program in the event of a major earthquake. The reconstruction guidelines, as modified by the simulation exercise and further deliberation, could be incorporated into state and federal earthquake plans. Tentative plans for local facilitating procedures and for mobilization of nongovernment resources could also be formalized. It is hoped that the simulation exercise will result in such planning inputs, as well as more extensive discussion at the local level regarding improvements in the mechanisms for interjurisdictional decisionmaking.

The experience gained in directing the simulation exercise will result in an improved format that can be replicated easily. With minimal adjustments, this simulation technique can be applied to test multijurisdictional decisionmaking during the reconstruction period in other areas and for other types of disaster.

V IMPLEMENTATION REQUIREMENTS

Section IV provided the framework for a simulation exercise designed to put federal, state, and local officials in the position of addressing reconstruction issues and setting priorities. This section outlines the steps that would be required to implement the simulation exercise. They include the following:

- Prepare simulation documents
- Conduct the simulation
- Prepare evaluation of the exercise.

These steps are discussed briefly below.

Prepare Simulation Documents

Two documents will be prepared for distribution to the participants:

- A Briefing Book: Earthquake Scenario. An abbreviated version of the scenario will be prepared to be mailed out to participants before the meeting and to be used as the basis for discussion in the briefing sessions immediately before each meeting. Separate versions may be prepared for each meeting.
- Discussion Draft: State/Federal Reconstruction Guidelines. The Guidelines presented in Apppendix D, modified to reflect inputs from agency interviews, will be an agenda item at the state meeting and (as further modified) will be the basis for discussion at the regional meeting.

The regional and local meetings, particularly the latter, could be improved if specific local detail were included in the scenario for the localities participating in the simulation. After the local governments to be

included have been selected, the research staff will work with local officials and representatives of other local organizations to add such detail. In practice, this will constitute a series of assumptions regarding damage, continuing problems, and reconstruction requirements in the community--an extension of the more macro information in the general scenario.

Other documents will be prepared to guide the research staff in leading the briefing sessions before each meeting. These will be concerned primarily with issues and with stimulating participants to clarify positions. For those participating in the state meeting, the major issues relate to reconstruction goals and priorities and to roles and responsibilities, as outlined in Section III. For those participating from local government, the issues are quite specific and could include the following:

- Should building permits be issued to anyone who asks, using the present building codes (which may have good seismic provisions for new construction)?
- Should a moratorium be placed on building permits in certain areas, such as those near fault lines and those containing filled land that has liquefied during the earthquake?
- Should a building permit moratorium be adopted until the merits of a major rezoning are considered?
- Should different building standards be adopted for major reconstruction of existing buildings than for new buildings as a means of encouraging rapid reconstruction?
- Should a moratorium be placed on building permits in order to concentrate available labor force on restoration of essential services such as water supply, sewage treatment, public streets, schools, and other public facilities?
- Should priority be given to the rebuilding of facilities for food sales, medical services, money exchange (banking), and housing? Should this be a function of local government?
- Should the supply of workers be controlled? Is this a local government function?
- How can the federal and state governments be prevented from making local decisions during the reconstruction without loss of federal and state aid?

- Should federal and state officials be encouraged to impose rationing or control prices in order to prevent profiteering?
- What kinds of aid should be requested from federal officials while the disaster is fresh in their minds?

The documents identifying these issues will not be handed out but will be used as guides by staff leading the briefing sessions to prepare specific groups of participants for the simulation meetings. There will be different versions because the concerns of various participant groups differ.

Other documents will be prepared to guide observers of the simulation meetings. These will be tied to the meeting agendas and will indicate the outputs expected from the various agenda items. If these outputs are not forthcoming, the observer will, if possible, arrange for inputs from the outside to stimulate discussion or will make a point of raising the issue(s) at the postmortem discussion after the meeting.

Conduct the Simulation

Arrangements should be made to conduct the simulation meetings at locations convenient for the participants. It would be appropriate to conduct the state and regional meetings at the state OES regional office in Concord. This would be the likely location in the event of the disaster specified in the scenario and is convenient to the federal and local government and private-sector participants. The local meeting could be held at the city hall (or county offices) of the entity involved; this arrangement would permit ready access to other local government officials or staff if found to be desirable during the meeting.*

*The alternative of holding the simulation meeting at a location where outside contacts can be limited to those incorporated in the simulation should also be considered. This approach permits closer control and perhaps more realism than if meetings are held at the normal place of business.

As indicated in Section IV, briefing sessions for different participant groups will be held before each meeting. Staff leading these sessions and acting as observers during the meetings need to be familiar with the disaster-related problems and issues as well as be experienced at conducting briefings. They must also be capable of observing responses of the participants and preparing a comprehensive evaluation of the simulation exercise.

Prepare Evaluation of the Exercise

The exercise will be evaluated by both the observers and the participants. The former will rate the briefing sessions in terms of type and quality of participation of those involved and will assess the simulation meetings in terms of the actual versus the expected outputs. The participants will be provided with questionnaires designed to elicit their reactions to both the briefings and the meetings and their suggestions for improvement.

These inputs will provide the basis for modifying the simulation exercise for purposes of replication--locally for local and regional meetings or elsewhere for disasters of the same or different types. The State/Federal Reconstruction Guidelines will also be modified as required and made available for inclusion in federal and state earthquake plans.

Time and Cost of Implementation

The time and cost of implementing the simulation exercise will depend on the elements included and the number of local meetings. It is suggested that the initial implementation phase be limited to a state meeting, a regional meeting, and one local meeting, both to test the procedures and to identify modifications to improve the effectiveness of the exercise.

Based on the results of this phase, a decision can be made regarding the value of additional simulations. Consideration could be given to conducting additional local meetings, primarily for educational purposes but also to obtain a more diverse set of local concerns and reactions to proposed goals, priorities, and administrative procedures. The desirability of conducting a second regional meeting that would reflect this greater diversity could also be assessed.

Appendix A

DETAILED EARTHQUAKE SCENARIO: A SEVERE EARTHQUAKE IN THE SAN FRANCISCO BAY AREA

Appendix A

DETAILED EARTHQUAKE SCENARIO: A SEVERE EARTHQUAKE IN THE SAN FRANCISCO BAY AREA

The scenario described in this appendix provides the basis for testing multijurisdictional responses to a severe areawide natural disaster by public and private organizations during the reorganization period, i.e., subsequent to the immediate survival period but prior to the recovery and reconstruction period. For purposes of this test, it is assumed that a massive earthquake occurred in the San Francisco Bay Area at 7:30 a.m., Pacific Standard Time (PST), October 30, 1979. The earthquake was on the San Andreas Fault, with its epicenter in the vicinity of Bolinas in Marin County, approximately 15 miles northwest of the Presidio of San Francisco.

Magnitude

The magnitude of the earthquake was 8.3 on the Richter scale. All nine counties (including 50 cities) surrounding the Bay suffered widespread damage, with Alameda, San Francisco, San Mateo, and Santa Clara Counties incurring damage of near catastrophic proportions. Statistical data are provided for each of the nine counties, but emphasis in the discussion is placed on the four counties suffering the most severe damage. The simulation described in Volume I is designed to deal with these extreme conditions.

The earthquake began with a small, rolling motion and built up to a maximum magnitude of 8.3 in 40 seconds. It then stopped for 10 seconds and again rolled violently for 25 additional seconds. During the following 48 hours, there were 50 aftershocks, 10 of which exceeded magnitude 6 during

the first day and 25 of which exceeded magnitude 4 during the second day. Minor tremors of less than magnitude 4 continued from D+2 through D+7.* Many structures that had suffered severe damage during the initial shock were completely destroyed during the subsequent aftershocks.

Incidence of Fire

Following the earthquake, there were many serious, uncontrolled fires in San Francisco, concentrated primarily in the Western Addition, the Mission District, and the Marina, generally where the water mains were seriously ruptured. About 25% of the firefighting service was inoperable during the first day because of building and equipment damage and blocked streets. Several city blocks were lost, but no general conflagration or firestorm occurred. This is in sharp contrast to the 1906 earthquake. Four high-rise commercial structures burned, but with a relatively small loss of life because the majority of the people had not yet arrived for work. These fires were contained during the first day and completely extinguished by the end of D+2. Additionally, there were numerous, widely scattered fires in some of the adjoining residences or commercial buildings, caused by overturned stoves, ruptured gas lines, and shorted electrical circuits. The surviving fire services were able to contain and extinguish them by the end of the third day. None of these scattered, individual fires exceeded more than one block in extent. The fire pattern was similar in the other cities on the Peninsula. Each city had at least one major uncontrolled fire in its industrial area and a few scattered fires in its residential districts. The residential fires were generally extinguished by the end of the first day, the industrial fires contained by the end of D+1, and fully extinguished by the end of D+2.

*The day of the earthquake is designated D; the days after are designated D+1, D+2, etc.

In the East Bay, the fire situation was of lesser magnitude and was restricted entirely to scattered areas west of Routes 17 and 80, where there was also considerable structural damage and rupturing of water mains. One of the major fires, which remained uncontrolled for three days, was in and around the Oakland Army Terminal and Navy Supply Center Another, but of lesser extent, was in Alameda; and a third was on the west side of Hayward. There were also widely scattered residential fires in San Leandro, Alameda, Berkeley, and Richmond. Except for the massive fire in the Army/Navy supply area, all fires were extigguished by the end of D+1.

From the few residential fires along the east slopes of the coastal range in San Mateo and Santa Clara counties, fire spread rapidly to the dry underbrush and trees. Because of preoccupation with fighting and containing the urban residential and industrial fires, the brush fires in the rural areas and on the eastern slopes of the coastal range raged out of control for the first 3 to 4 days after the earthquake. As of D+7, these fires have been contained to the area east of Skyline Boulevard, south of Route 92 and northwest of Route 17 in San Mateo and Santa Clara counties. Major effort is now underway to extinguish them. Similar brush/forest fires were ignited from residential fires in Marin County in the area west of Route 101 and south of Bodega Bay. As of D+7, there are at least three major fires in this area that are still out of control.

Fatalities and Injuries

As of D+7, more than 10,000 bodies have been recovered--approximately 3,000 of which have not yet been identified. Some 1,600 additional people are reported missing, many of whom must be assumed to be buried in the debris and rubble or drowned in the bay. There are approximately 9,000 casualties who will require extensive hospital care for more than 30 days. Also, there are almost 21,000 people with lesser injuries who will require 1 to 2 weeks of additional hospitalization. Over and above the casualties requiring hospitalization, there are about 28,000 ambulatory casualties who will continue to require outpatient care of various kinds for the next

month. Additionally, during the first week, first aid was rendered to more than 200,000 individuals; these people apparently require no further medical aid. The number of emotionally and mentally disturbed people is unknown at this point, but the continuing aftershocks will undoubtedly affect many. Of the 5 million people in the area prior to the disaster, reports as of D+7 indicate 10,370 fatalities, about 300,000 injuries, and approximately 4.7 million who have required no medical care to date. Table A-1 summarizes these data for the nine counties.

Fortunately, none of the reservoir dams failed as a result of this earthquake. However, had any of the major dams failed, the fatalities, injuries, and property damage might well have been two to four times greater.

Impact on Residences and Residents

Prior to the earthquake, there were more than 1.9 million livable dwelling units in use in the nine-county area: 1.264 million were single-family dwelling units and 655,000 were units in multiple dwellings (Table A-2). Reconnaissance and survey (as of D+7) indicate that 2,900 single-family homes have been destroyed; and 1,400 additional homes, in which people are still living, are so badly damaged they must be demolished as soon as feasible. Further, 7,000 housing units in multiple dwellings have been destroyed and 3,100 additional units, in which people are still living, are so badly damaged that they also must be demolished. With the aftershocks that are continuing to occur, many of these buildings could collapse with the potential for considerable additional loss of life. An additional 28,000 dwelling units have been extensively damaged but are structurally sound; they can be restored with major repairs. Although extensively damaged, these units are occupied. In the remaining 1.88 million dwelling units, there is widespread glass breakage, fracture of water and gas pipes, cracked plaster, and minor structural damage. At this time, the estimated cost of replacing and repairing the damaged residential units is about $5 billion, and this estimate is probably conservative. The breakdown of this estimate is summarized in Table A-3.

Table A-1

Fatalities and Injuries as of D+7

	Projected* 1979 Population Prior to Disaster	Reported Fatalities as of D+7 Days	People Reported Missing as of D+7	Survivors Requiring Extensive Hospitalization 30 days	Survivors Requiring 1 to 2 weeks additional Hospitalization	Ambulatory Casualties Requiring Out Patient Care	No Given First Aid but now OK	Total Surviving Population 1-(2+3)	No. Uninjured as of D+7 8-(4+5+6)
Alameda	1,113,000	2,700	600	2,070	4,830	6,760	60,750	1,109,700	1,096,040
Contra Costa	631,000	800	80	750	1,730	2,400	21,700	630,120	625,240
Marin	226,400	500	70	420	980	1,360	12,200	225,830	223,070
Napa	96,900	10	5	10	20	30	250	96,885	96,825
San Francisco	659,900	2,000	400	1,950	4,550	5,540	49,700	657,500	645,460
San Mateo	583,100	1,200	150	1,070	2,500	3,300	29,800	581,750	574,880
Santa Clara	1,233,100	2,600	250	2,080	4,870	6,700	61,100	1,230,250	1,216,600
Solano	215,700	80	10	100	230	150	1,300	215,610	215,130
Sonoma	271,600	480	60	420	980	1,500	13,400	271,060	268,160
Totals	5,030,700	10,370	1,625	8,870	20,690	27,740	239,220	5,018,705	4,961,505

* Source: Association of Bay Area Governments (ABAG) Projections 79, 1980-2000; Berkeley, California, April 1979; National Oceanic and Atmospheric Administration (NOAA), "A Study of Earthquake Losses in the San Francisco Bay Area," prepared for the Office of Emergency Preparedness, 1972; SRI International.

Table A-2

DWELLING UNITS LOST AND NUMBER OF HOMELESS

	Predisaster Dwelling Units*		Number of Family Homes		Number of Multiple Dwelling Units		Number of Dwelling Units		Number of People	
	Single Family	Units in Multiple Dwellings	Destroyed	Requiring Demolition	Destroyed	Requiring Demolition	Requiring Extensive Repairs	Livable With Minor Repairs	Longterm Homeless*	Living in Damaged Repairable Homes
Alameda	262,120	164,200	200	150	280	140	1,540	424,010	2,170	4,400
Contra Costa	182,900	46,750	20	10	50	30	220	229,320	340	700
Marin	62,710	22,050	50	30	130	60	470	84,020	760	1,400
Napa	30,820	5,270	10	10	20	10	80	35,960	100	200
San Francisco	103,100	200,900	1,400	600	4,000	2,000	15,400	280,600	18,400	35,600
San Mateo	156,880	60,440	800	350	1,700	800	7,040	206,630	10,600	20,600
Santa Clara	316,200	122,730	400	200	700	300	3,000	434,330	4,900	9,400
Solano	59,230	18,900	15	5	15	5	80	78,010	100	200
Sonoma	90,070	13,700	40	20	100	40	400	103,170	540	1,000
Total	1,264,030	654,940	2,935	1,375	6,995	3,385	28,230	1,876,050	37,910	73,500

* Does not include hospitalized survivors from Table 1.

Sources: NOAA (see Table 2), SRI International

Table A-3

ESTIMATED COST FOR REPLACING/REPAIRING RESIDENTIAL UNITS

Extent of Damage	Units	Estimate Cost Per Unit	Estimate Cost Total (millions)
Destroyed	14,690	$75,000	$1,102
Extensive	28,230	25,000	706
Moderate	500,000	5,000	2,500
Minimum	1,000,000	500	500
Total			$4,808

Almost 38,000 residents of dwelling units that have been destroyed and those that must be demolished have been (or soon will be) rendered homeless for a long period of time. The rebuilding of these 15,000 residences is not likely to get underway for at least 6 months and will require 2 to 3 years, at a minimum, to complete. The clearance of debris, replacement of the urban infrastructure, restoration of transportation and utilities, and reconstruction of the industrial/commercial base will be proceeding with the construction and repair of residences. The total demand for construction equipment, supplies, and personnel will far exceed available short-term local, state, and national resources. Even with the development of an effective overall reconstruction plan and the establishment of priorities, it would be unrealistic to program the total reconstruction effort over a period of less than 10 or more years.

In addition to the above 38,000 long-term homeless, there are an additional 73,000 people living in dwelling units that, by normal standards, would be considered unlivable because of their requirement for extensive repairs. Also, as of D+7, it is estimated that upwards of 4 million people are living in dwellings that have sustained at least extensive window breakage and other minor damage.

Since the earthquake occured at 7:30 a.m. on a regular workday, tens of thousands of people were in transit, in both public transportation facilities and their own cars, at the time of the event. It is estimated that

about 200,000 commuters were on their way into or out of San Francisco, and about 100,000 commuters were on their way into or out of the greater Oakland/Berkeley area. Because of the widespread and severe damage to transportation facilities and highways, most of the vehicles in transit were temporarily abandoned. As of D+7, the majority of those who were in transit have either returned to their homes, are in public shelter, or have been temporarily taken in by people whose dwellings have survived.

Impact on Industrial/Commercial Buildings

As of D+7, the survey of industrial and commercial buildings is still under way and an exact inventory of damage is not yet available. However, preliminary data indicate that almost 5,000 of these buildings, distributed as follows, either have collapsed or have been so extensively damaged that they will have to be demolished:

Alameda County	500
Contra Costa County	50
Marin County	100
San Francisco County	2,500
San Mateo County	1,100
Santa Clara County	500
Total	4,750

This means that approximately 5% of the total number of industrial/commercial buildings in this area either have been or must be destroyed. Another approximately 5,000 industrial/commercial buildings have suffered moderate to heavy damage but can be repaired. Also, several thousand other industrial/commercial buildings have sustained light damage such as window breakage and cracked plaster.

The majority of the destroyed and severely damaged industrial/commercial structures were on the structurally poor ground and fill land surrounding San Francisco Bay, in the strip extending from one-half mile west to two

miles east of the San Andreas Fault, and in the areas subject to landslides. Figure A-1 shows the areas of high earthquake intensity in the Bay Area and Figure A-2 shows the locations of areas of potential liquefaction or structurally damaging landslides. Figure A-3 shows the distribution of industrial/commercial buildings; comparison of the figures indicates the areas where buildings have sustained severe damage.

In San Mateo County, there were generally two areas of moderate to severe industrial/commercial damage: from Route 101 eastward to the bay and from the eastern edge of the coastal range eastward almost to El Camino Real (Route 82). In Santa Clara County, there were two areas of like damage: from Route 101 eastward and Route 237 northward to the bay; and from the Morgan Hill-Los Gatos-Campbell area northeastward to San Jose. In Alameda and Contra Costa Counties, the areas of heavy industrial/commercial damage were west of Route 17 from the county line at San Jose northward to San Lorenzo west of Mac Arthur and Foothill Boulevards from San Lorenzo northward to Berkeley, and west of San Pablo Avenue from Berkeley north across Richmond in Contra Costa County. In Marin County the heavy industrial/commercial damage was concentrated in the cities of Fairfield, Novato, San Rafael, and Sausalito.

On the other hand, the majority of school buildings in the area have survived with minor structural damage, but with widespread and extensive window breakage. None of the schools collapsed, and those few that did sustain moderate to heavy damage were either in the immediate San Andreas Fault zone or on structurally poor ground around the bay. Thus, the majority of the schools could be made usable in about 2 weeks, except for the restoration of electrical, water and sewage services, which in many of the damaged areas will be a much longer-term problem.

Table A-4 is a report from the U.S. Army Corps of Engineers on the status of the office buildings in which federal agencies were housed prior to the disaster. As is obvious from the report, most of these structures have sustained severe damage. Some will have to be demolished; most of the

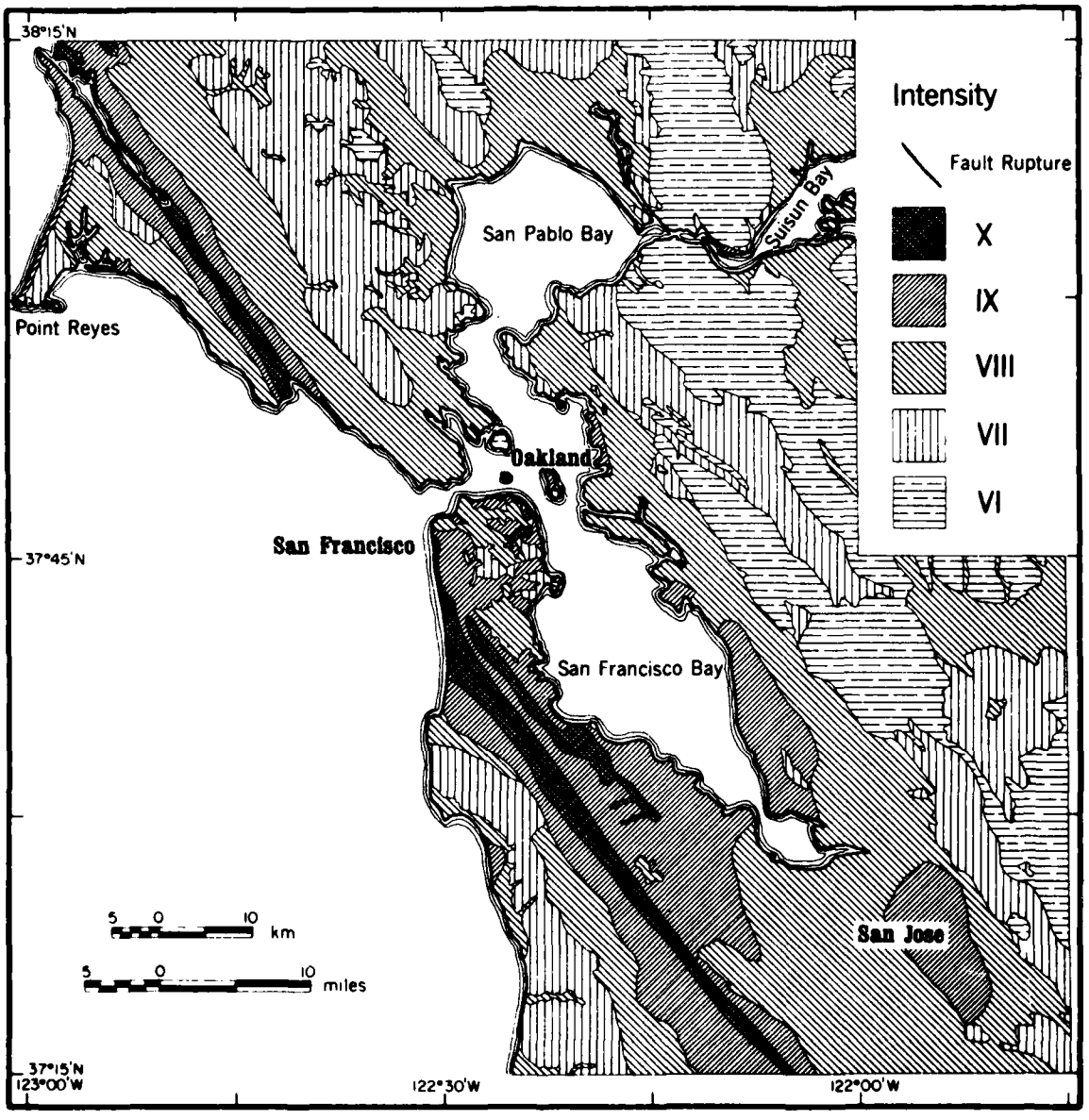


FIGURE A-1 INTENSITY DISTRIBUTION FROM A MAGNITUDE 8.3 EARTHQUAKE ON THE SAN ANDREAS FAULT

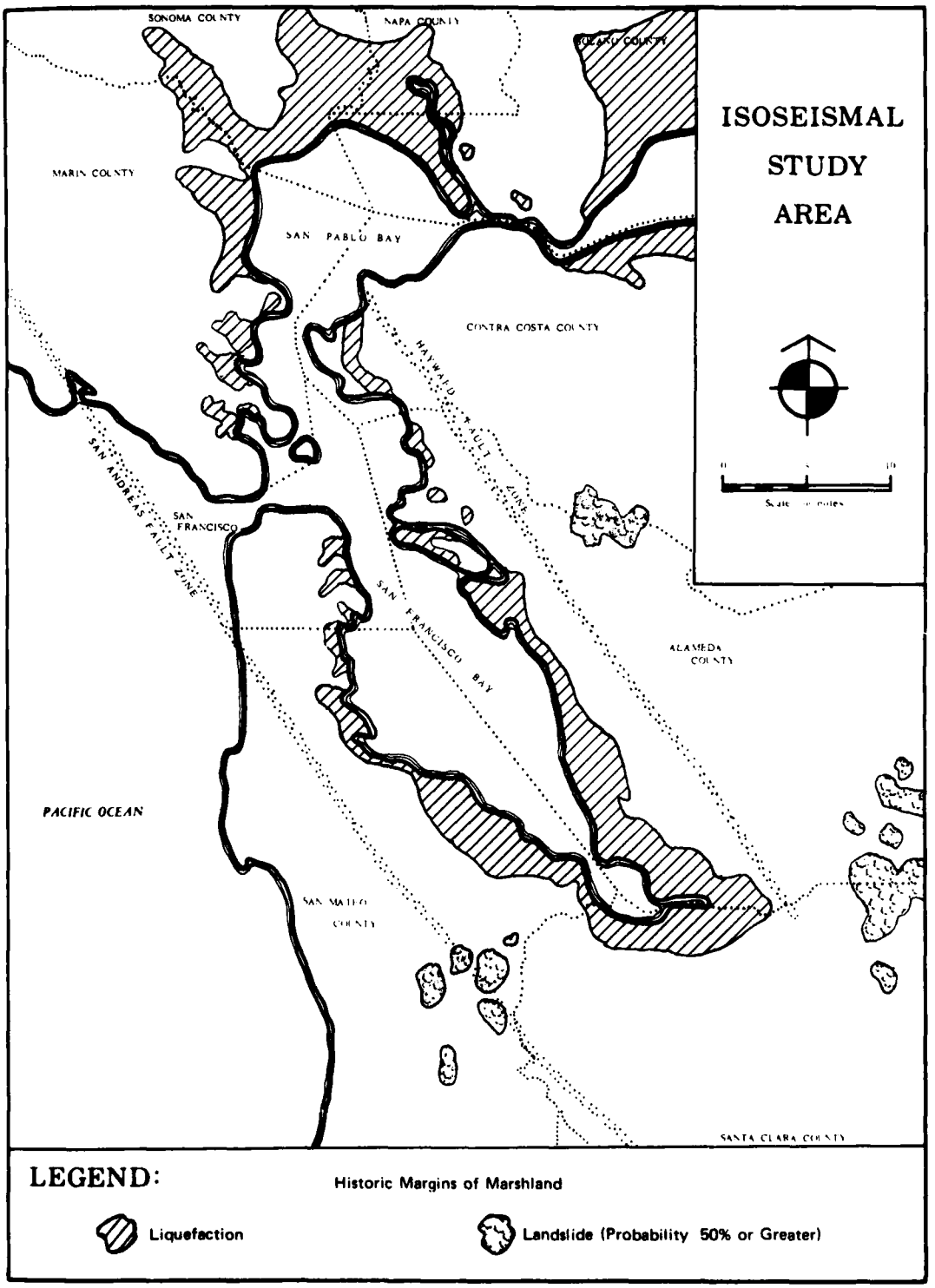


FIGURE A-2 AREAS OF MAJOR POTENTIAL LIQUEFACTION AND LANDSLIDES HAZARDS

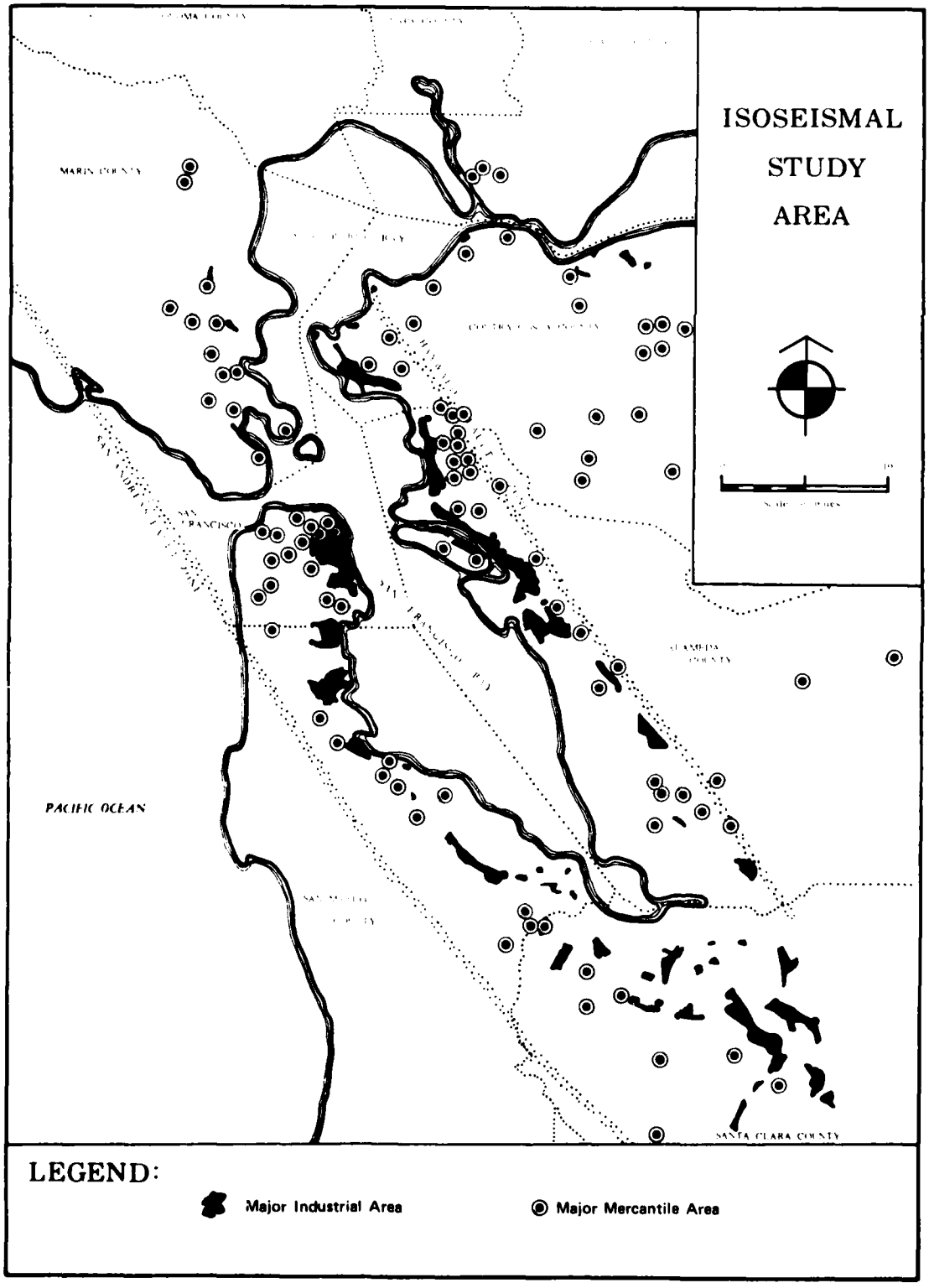


FIGURE A-3 MAJOR INDUSTRIAL AND MERCANTILE AREAS

Table A-4

Status of Damage in Federally Occupied Buildings

Agency	Location	Damage Code(s)
DOT-FAA	831 Mitten Rd Burlingame	N.A.
DOT-FHWA	2 Embarcadero Center	1, 2, 3, 6/7
DOT-FRA	2 Embarcadero Center	1, 2, 3, 6/7
DOT-RETCO	630 Sansome	1, 2, 4, 7
DOT-UMTA	2 Embarcadero Center - Suite 620	1, 2, 3, 6/7
DOT-USCG	630 Sansome	1, 2, 4, 7
DOD-Sixth USA	HQ Presidio SF	N.A.
DOD-COE	211 Main	1, 2, 3/4/5, 6
DOD-DCPA	3900 Finley Ave Santa Rosa	N.A.
DA-USFS	630 Sansome	1, 2, 4, 7
DA-FNS	550 Kearny 1 Embarcadero Center	1, 3 1, 2, 3, 6/7
DOC-MARAD	450 Golden Gate Ave	3, 7
DOC-NOAA	450 Golden Gate Ave	3, 7
DOC-NWS	450 Golden Gate Ave	3, 7
ANRC-SA	1550 Sutter 1625 Van Ness Ave	5 3/6
USGS	555 Battery	1, 2, 3/4, 6/7
DHEW	50 United Nations Plaza	5/6, 7
DOJ	100 Mission	1, 2, 3/4/5, 6
DOL-OSHA	211 Main	1, 2, 3/4/5, 6
EPA	100 California	1, 2, 4, 6
FBI	450 Golden Gate Ave	3, 7
FCC	555 Battery	1, 2, 3/4, 6/7
FEMA	211 Main	1, 2, 3/4/5, 6
GSA	525 Market	1, 2, 4/5, 7
ICC	211 Main	1, 2, 3/4/5, 6
SA	101 Valencia	1, 3/5, 7
CRWRC	2914 Encinal Ave Alameda	N.A.
MDS	142 Beulah	N.A.
USPS	Brannon & Beale & Bryant	1, 2, 3, 4, 7
VA	42nd & Clement	N.A.
SF Civic Center	Civic Center	1, 3, 4, 5, 7

Damage Codes

1. Hazard area due to liquefication
2. Approximate area of inundation
3. Severe building damage
4. Heavy building damage
5. Moderate building damage
6. Violent ground shaking
7. Very strong ground shaking

Reference: Scenario for Sixth Army Earthquake Response Plan Exercise, 19-20 Sept. 1979. Unpublished.

others will require extensive repairs before they can be occupied. The restoration of these and the other damaged industrial/commercial facilities around the Bay Area obviously will comprise a major construction effort that will take several years to accomplish. As of D+7, the estimated cost of replacing and repairing the damaged industrial/commercial facilities is $5 to $7.5 billion in 1979 dollars, but this estimate must be considered very tentative and preliminary.

Impact on Transportation

Transportation has been severely affected. Bridge approaches have collapsed; highways have buckled or have been covered with debris from collapsed buildings and overpasses or from landslides; tracks have been ripped up and airport runways damaged. Figure A-4 shows the major transportation routes in the Bay Area.

Bridges

Table A-5 indicates the condition of the Bay Area bridges at D+7 and the vehicles and people affected. This information is summarized below.

Bay Bridge

The east approaches are completely destroyed, elevated interchange structures east of the toll plaza have collapsed, and elevated approach structures at the west end have collapsed. However, the basic structure of the bridge has survived with apparently minor damage, and the Yerba Buena Tunnel has survived. Twenty-seven hundred vehicles and their occupants were trapped on the bridge. As of D+7, a temporary foot bridge has been completed from the East Bay approach. The trapped people (about 5,000) have walked off the bridge and are temporarily housed in public shelters in eastern Oakland. The Corps of Engineers (COE) estimates that 12 to 18 months

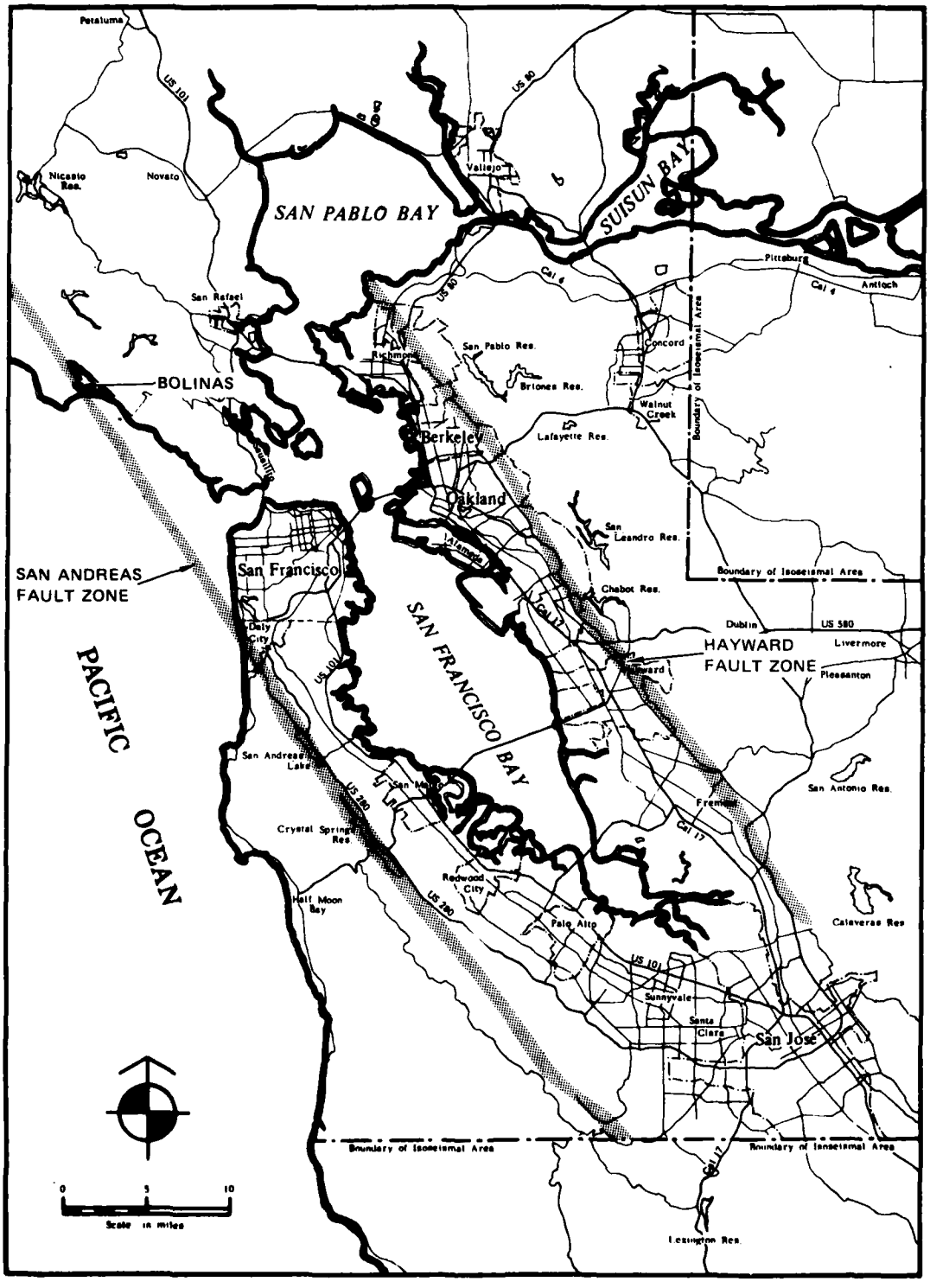


FIGURE A-4 MAJOR TRANSPORTATION ROUTES

Table A-5

CONDITION OF BAY AREA BRIDGES AT D+7

	Number of Trapped Vehicles	Number of Trapped People	Method of Escape	Time To Restore Bridge (Years)
Bay Bridge East approach destroyed West approach collapsed	2,700	5,000	Footbridge built	1 to 1-1/2
Golden Gate Bridge Both approaches heavily damaged Extensive landslide in South Marin City	1,200	2,000	Temporary walkway built at s. approach	1/2 to 1
San Mateo Bridge Both approaches destroyed or under water	2,400	5,000	Boat	1 to 2
Dumbarton Bridge Both approaches destroyed or under water	1,000	1,800	Boat	2 to 2+
Richmond-San Rafael Bridge Both approaches badly damaged, partially under water	1,500	3,000	Boat	1/2 to 1
Carquinez St. Bridge (Rte. 80) Minor damage only				Fully operational
Martinez Bridge Minor damage only				Fully operational

will be needed to rebuild the approaches to the bridge. No cost estimate is available at this time.

Golden Gate Bridge

Both approches to the bridge are extensively damaged. The tunnels north of the bridge and through the Presidio (Route 1) have survived, but major and extensive landslides have occurred on the north side in southern Marin County. The basic structure of the bridge has survived. Twelve-hundred vehicles and their occupants (about 2,000 people) were trapped on the bridge. A sufficient portion of the southern approach remained so that a temporary walkway could be built during D+1 and D+2; and the trapped people were able to walk off the bridge. They are still temporarily housed in public shelters in and around the Presidio. COE estimates that 6 to 12 months would be required to restore the approaches to the bridge and clear the landslides. No cost estimate is available at this time.

San Mateo Bridge

Both approaches have been destroyed or are under water. Some segments of the low-level portions of the bridge have collapsed, but the elevated structure over the channel has survived with little or no damage. Twenty-four hundred vehicles and occupants (about 5,000) were trapped on the bridge. The people have been removed by boat and are temporarily housed in public shelters in San Mateo and Hayward. The COE estimates that 1 to 2 years would be required to restore the bridge. No cost estimates are available at this time.

Dumbarton Bridge

Both approaches have been destroyed or are under water. The basic bridge is so extensively damaged that it is not salvageable. One thousand vehicles

and occupants (about 1,800) were trapped on the bridge. The people have been removed by boat and are temporarily housed in public shelters in Menlo Park and Palo Alto. COE estimates that 2 years or more will be required to complete the new structure (now being built) and the approaches. There are no cost estimates.

Richmond-San Rafael Bridge

Both approaches are badly damaged and partially under water. The elevated structure has survived with little or no damage. Fifteen-hundred vehicles and their occupants (about 3,000) were trapped on the bridge. The people have been removed by boat and are temporarily housed in public shelters in San Rafael and Richmond. COE estimates that 6 to 12 months will be required to repair the bridge. No cost estimate is available.

Carquinez Strait (Route 80) and Martinez Bridges (Route 680)

The bridges have suffered minor damage only, and are fully operational as of D+7.

Highways, Freeways, and Roadways

Routes In the Cities

In San Francisco and Oakland, many portions of the elevated highways are severely damaged and several of the approaches have collapsed, stranding hundreds of vehicles. In San Francisco, the Broadway Tunnel collapsed. Many streets were initially blocked because of widespread debris and abandoned vehicles, particularly in the Embarcadero, along and to the southeast of Market Street, in the Civic Center area, along Van Ness south of Geary and in the extreme southwest portion of the city. Portions of the

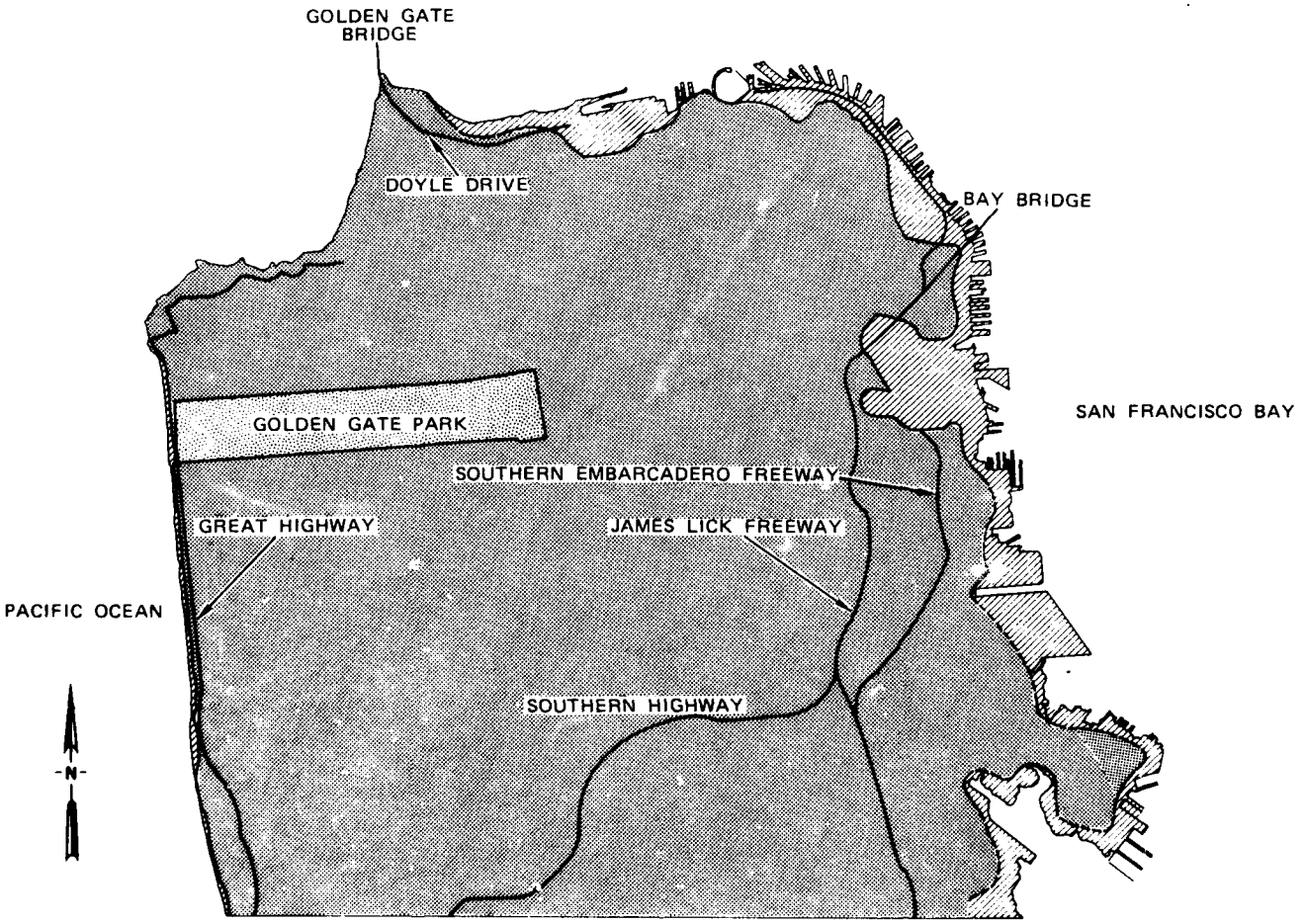
Great Highway were washed out because of a tsunami and there was considerable inundation in the low lying areas of San Francisco (Figure A-5). Similarly, in Oakland, many streets west of Route 580 were initially blocked, and all streets west of Route 17 were blocked for several days because of overpass failures and debris in the streets (see Figure A-6). A similar pattern of debris-blocked highways exists in the other cities around the immediate Bay Area east of Route 101 and west of Route 17. In the Daly City, San Bruno, and Pacifica areas, there has been extensive destruction of highways because of surface faulting; and at Daly City a couple of ocean-fronting bluffs have slid into the Pacific Ocean. Pacifica was cut off and isolated for 3 days.

As of D+7, at least one street has been opened and cleared into each area of the cities of San Francisco and Oakland; however, access still has not been realized to most of the piers along the water fronts of San Francisco and Oakland had not been cleared because of the extensive destruction of buildings, heavy mass of debris in this area, subsidence of the land and liquefaction of the soil.

Intercity Routes

A summary of the condition of intercity routes at D+7 appears in Table A-6.

Route 101 (Bayshore Freeway)--Elevated portions in San Francisco are extensively damaged and accesses are unusable; from Candlestick Park to San Bruno, there is heavy damage due to soil movement and large sections are under water; from Oyster Point to Marsh Road many overpasses on Route 101 have collapsed or are extensively damaged; from San Mateo to Palo Alto, the freeway is in similar condition because of soil movement and liquefaction. Further, some sections between Palo Alto and the intersection with Route 17 are not usable. From San Jose south, Route 101 is fully operational.



———Contour of areas of inundation due to 20-foot tsunami at the Golden gate

– – – – –Approximate contour of areas of inundation due to 20-foot tsunami at the Golden Gate

SOURCE: John A Blume & Associates, *San Francisco Seismic Safety Investigation*, prepared for the Department of City Planning, San Francisco, June 1974

FIGURE A-5 AREAS OF POTENTIAL TSUNAMI INUNDATION

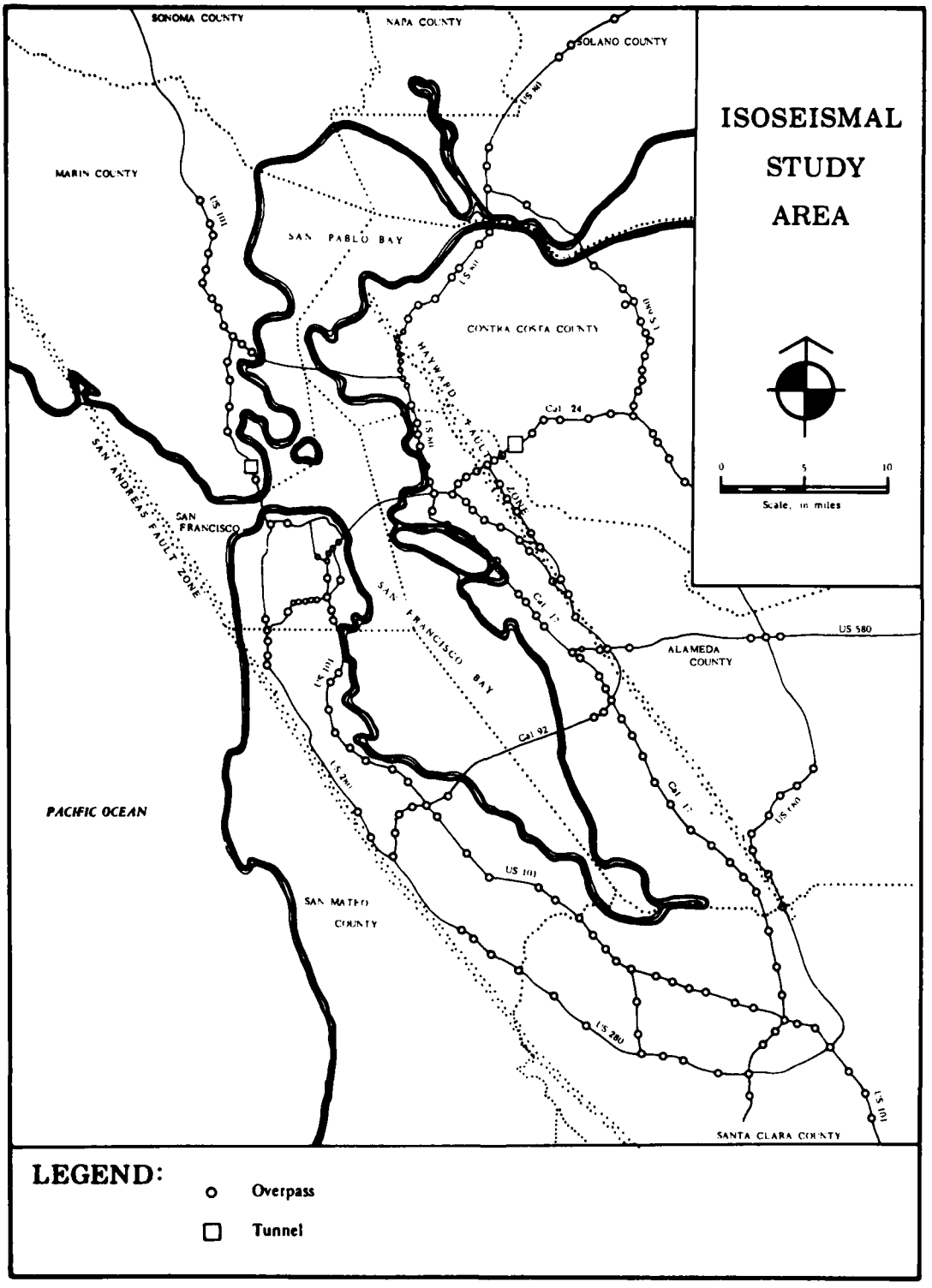


FIGURE A-6 OVERPASSES ON MAJOR FREEWAY ROUTES

TABLE A-6

CONDITION OF INTERCITY ROUTES AT D+7

	COLLAPSED OR EXTENSIVELY DAMAGED	ACCESSES COLLAPSED OR NOT USABLE	OVERPASSES COLLAPSED OR NOT USABLE	OVERPASSES DAMAGED BUT NOT COLLAPSED	LIQUIFICATION OR SECTIONS UNDER WATER	DAMAGED BUT USABLE	OPERATIONAL	YEARS TO REPAIR	NO. OF VEHICLES ABANDONED
ROUTE 101: Bayshore Freeway								3 to 5	2500
Elevated Portions	X	X							
Candlestick Pk. to San Bruno	X				X				
Oyster Pt. to Marsh Rd.	X								
San Mateo to Palo Alto	X		X						
Portions between P.A. & Rte. 17									
San Jose Southward						X	X		
ROUTE 280: Junipero Serra Freeway								3 to 5	2500
Across S.F. elevated/accesses	X		X						
Daly City, South S.F., San Bruno	X		X						
Rte. 92 North to 280			X						
Rte. 84 & Page Mill Rd. South of Rte. 92			X						
Page Mill South to Rte. 17 (damaged to Stevens Creek Pkwy)				X					
ROUTE 17: NIMITZ FWY.									15000
San Jose North to San Leandro	X								
98th Ave. North to Rte. 80			X						
Streets between Rte. 17 & Bay					X				
Webster & Posey Tubes		X							
Rtes 80/17 from Bay Bridge to El Cerrito					X				
From El Cerrito West to Bay					X				
Richmond north Rte 80							X		
ROUTE 82: EL CAMINO REAL							X		
NORTH-SOUTH AND WEST to EAST STREETS							X	2	
MARIN COUNTY								2	
Route 101 from Santa Rosa South (landslides)	X		X						
Route 1 (faulting & landslides)	X								
Route 37 at Northern end of Bay between Routes 80 & 101	X				X				
Solano, Napa & Sonoma Cities roads/highways							X		

Sources: NOAA (see Table 2); SRI International

Route 280 (Junipero Serra Freeway)--Elevated portions across San Francisco have experienced considerable damage, and many of the accesses have collapsed; in the Daly City-South San Francisco-San Bruno areas, Route 280 has virtually been destroyed because of surface faulting, and all overpasses from Route 92 northward have collapsed. South of Route 92, Route 84 and Page Mill Road overpasses have collapsed. None of the remaining overpasses south to Route 17 has collapsed, but several did sustain considerable damage as far south as Route 85.

As of D+7, it is estimated that more than 25,000 vehicles have been abandoned on Routes 101 and 280 between San Francisco and San Jose. As far as is known, the occupants of these vehicles have either walked back to their homes or are temporarily billeted in public shelters along the way. The COE estimates that repair and restoration of Routes 101 and 280 will constitute a long-term project, lasting 3 to 5 years. No cost estimates are available.

Route 82 (El Camino Real)--This highway has survived very well and, as of D+7, is the major north-south route from San Jose north across San Mateo County and into San Francisco. Route 92 overpass at San Mateo and Route 84 overpass at Atherton collapsed onto Route 82 during the initial quake. Route 82 was initially blocked by debris in various places in Hillsborough, Burlingame, San Bruno, and Daly City. However, as of D+7, the debris has been cleared from the road; satisfactory detours have been completed around the two collapsed overpasses; and several streets in San Francisco now have clear access to Route 82. At this time, Route 82 is open to emergency traffic only, and the average speed is 15 mph.

Route 17 (Nimitz Freeway)--From San Jose north to San Leandro, there are several sections that have sustained heavy damage due to soil movement and some liquefaction of road base. From 98th Avenue north to Route 80, Route 17 is not usable because most overpasses have either collapsed or are extensively damaged; much of the elevated portion of the route is in ruins. Many of the streets between Route 17 and the bay are not usable and some are under water. The Webster and Posey Tubes cannot be used

because of access failures. Routes 80 and 17 from the Bay Bridge access north to El Cerrito have suffered extensive damage due to soil movement and some liquefaction. Route 17 from El Cerrito westward to the bay has suffered similar damage. From Richmond north, Route 80 is not damaged and is open for normal traffic, except for control of access to and egress from the disaster area. As of D+7, it is estimated that more than 15,000 vehicles have been abandoned on Routes 17 and 80, and that their occupants have either walked back to their homes or are in public shelters along the way. The COE indicates that repair and restoration of Routes 17 and 80 will constitute a long-term project lasting 3 to 5 years. No cost estimates are available at this time.

Other Roads--The north-south and east-west streets and roadways east of Route 17 have survived with little damage and are generally usable. For example, San Pablo Avenue, 14th Street, Routes 580, 680, 13, and 238 are all open and clear as of D+7. Initially, there were some landslides in these areas and there was minor debris on the streets, but this has been cleared. Thus, there is ready access from the east, south, and north to the destroyed/damaged areas between Route 17 and the bay.

In Sonoma and Marin Counties many sections of Route 101 from Santa Rosa southward are not usable because of landslides and the collapse of three overpasses. Route 1 has been interdicted at many locations by surface faulting and extensive landslides. Several communities along the coast were cut off and isolated for several days, but, as of D+7, singlelane access has been opened to them around the northern and southern ends of the bay, between Routes 80 and 101 and between Routes 17 and 101. Routes 37 and 237 have suffered extensive damage due to soil movement and liquefaction, and many sections are underwater. Otherwise, roadway/highway damage in Solano, Napa, and Sonoma Counties has been scattered and relatively manageable.

As of D+7, alternate roadways and detours have been established for north-south traffic in Marin County and east-west traffic around the northern and southern ends of the bay. However, in most cases, these are secondary roads of limited weight capacity, and transportation is seriously

affected. The COE indicates that repair and restoration of Routes 37, 237, and 101 (in Marin County) and will require upwards of 2 years. No cost estimate is available.

Airports

The condition of the Bay Area airports at D+7 is summarized on Table A-7.

San Francisco International Airport

Many buildings have suffered extensive damage; a few have collapsed. The access overpass at Route 101 has collapsed and portions of the elevated highway at the airport have collapsed. Runways are completely unusable because of soil movement and considerable liquefaction. Some sections are under water. Air traffic control and navigation facilities have been heavily damaged. COE and FAA estimate that 6 months to a year will be required to restore operations.

Oakland International Airport and Alameda Naval Air Station

There is widespread moderate damage to buildings, air traffic control, and navigational facilities and runways. Access roads to these airports have been heavily damaged. As of D+7, helicopters are using these fields. USACE and FAA estimate that single-engine aircraft will be able to use the facilities in another week and four-engine craft (prop and jet) in about a month.

TABLE A-7

CONDITION OF AIRPORTS AT D+7

AIRPORTS	BUILDINGS COLLAPSED OR EXTENSIVELY DAMAGED	OVERPASSES COLLAPSED	ACCESSES COLLAPSED	RUNWAYS DAMAGED OR UNDER WATER OR LIQUIFIED	AIR NAVIGATION AND TRAFFIC CONTROL FACILITIES DAMAGED	OPERATIONAL	TO RESTORE
SAN FRANCISCO INTERNATIONAL	X	X	X	X	X		1/2 to 1 years
OAKLAND INTERNATIONAL Helicopters using fields	X		X	X	X		Single engine planes can use in 1 week; 4 engine planes in 1 month
ALAMEDA NAS				X			1/2 year
MOFFETT NAS	X			X			1/2 year
SAN JOSE MUNICIPAL	X			X			2 Weeks
FT ORD AIR STRIP						X	
Crissy Field (Presidio)	X						Operational only for helicopters at D+7

Sources: NOAA (see Table 2); SRI International

Moffett Field/NASA

There is extensive destruction of buildings and runways were heavily damaged through liquefaction and inundation from the bay. It is estimated that at least 6 months will be required to restore the facility.

San Jose Municipal Airport

There is extensive damage to buildings and some damage to runways. As of D+7, single-engine aircraft are using the airport. It is estimated that in about 2 weeks runways will be sufficiently repaired and air traffic/navigational facilities restored so that 727, 737, and DC-9-types of aircraft can use the field.

Other Bay Area Airports

There are numerous general aviation airports in the Bay Area. Many of these are located in areas of structurally-poor ground and have suffered extensive damage, e.g., Palo Alto, San Carlos, and Hayward. Those located further from San Francisco Bay, e.g., Santa Rosa and Fairfield, are operational, as is Travis Air Force Base in Solano County. The strip at Hamilton Field in Marin County (currently inactive) is also useable. As of D+7, a complete inventory of the condition of general aviation airports has not been made.

Air Strip at Fort Ord

The facility was not damaged and can handle C-130 type aircraft.

Crissy Field (Presidio)

The field is extensively damaged and was initially flooded; it is operational for helicopters only as of D+7.

Railroads

A summary of the condition of railroads and other public transportation appears in Table A-8. All railroads will be out of operation for from 3 to 6 months from Watsonville north into San Francisco, from Santa Rosa southward across Marin County, and from MacArthur Freeway/Mission Boulevard westward to the bay (including Newark, Hayward, San Leandro, Alameda, Oakland, Berkeley, and Richmond), because of bridge failures, liquefaction of roadbed, and damage (overturning) of rolling stock. The Southern Pacific Transportation Company and the Santa Fe Railroad are in the process of assessing damage and determining reconstruction priorities.

Public Transportation

Bay Area Rapid Transit

Although the transbay tube has survived the earthquake, the overall BART system has sustained considerable damage in the San Francisco area and along the elevated portion in the coastal areas of Alameda County. It is estimated that it will be out of service for several months.

Bus Service

As of D+7, public bus service has not been restored from San Jose-Santa Cruz northward into the Peninsula or into any areas west of Routes 17 and 80 along the East Bay. Most of the buses survived the earthquake. However, it

TABLE A-8

CONDITION OF PUBLIC TRANSPORTATION AT D+7

	CONSIDERABLE DAMAGE INCL. LIQUIFICATION	NOT IN OPERATION	SERVICE WILL BE RESTORED
BART			
S.F. Area	X		In several months
Elivated areas in Oakland	X		
BUS SERVICE			
San Jose/Santa Cruz to Bay		X	
West of Rtes. 17 or 80 to East Bay		X	
STREET CARS, S.F.	X		In several months
RAILROADS			
Watsonville to S.F.	X	X	3 to 6 months
Santa Rosa to Marin	X	X	

is estimated that at least 25% of them are still trapped on bridges and sections of highways that have been cut off. Each of the Transit Systems--Santa Clara County Transportation Agency, San Mateo County Transit District, Golden Gate Transit, and AC Transit--is inventorying rolling stock and assessing damage, as are the private systems--Greyhound, Trailways, and the various charter companies--and the school systems. The Metropolitan Transportation Commission with the assistance of CALTRANS is coordinating this activity.

San Francisco Transit Operations

Extensive damage has been done to rail lines and rolling stock across San Francisco. The system will not be back in operation for several months At the time of the earthquake approximately 25,000 people were using public transportation (commuter trains, BART, buses, streetcars). Most of the rolling stock, except a few buses, were blocked and abandoned. As of D+7, these commuters have either returned to their homes or are in public shelters along the way.

Port Facilities

The docks and waterfront port facilities have survived very well in San Francisco and Oakland, except for building failures and derailment of cranes. The tsunami was not of sufficient magnitude within San Francisco Bay to do extensive damage to port facilities. However, access to both Ports has been extremely difficult because of collapsed freeway structures and buildings, roadway failures, and massive amounts of heavy debris blocking all access routes. The deep water facility at Hunters Point survived very well, but access is still blocked because of liquefaction of approach roads and heavy landslides from the hills west and north of Candlestick Park and between Hunters Point and Route 101. As of D+7, it is estimated that access will be accomplished in about 3 more days, and the docks will be at least partially operational in 1 to 2 weeks.

Impact on Utilities

Dams and Reservoirs

Figure A-7 shows the major dams and reservoirs in the area. There were no dam or reservoir failures in the nine-county area. However, there was minor leakage from Crystal Springs Dam, and 20,000 residents were evacuated from below the dam. There was similar minor leakage from Lexington Dam, and 10,000 residents were evacuated from below that dam. There appeared to be some weakening of the Upper San Leandro and Chabot Dams and upwards of 25,000 people were evacuated from below these dams. As of D+7, the water levels behind these dams have been sufficiently lowered to eliminate further risk, and more than 90% of the evacuees have returned to their homes. The remaining 10% refuse to return because of fear, and they are temporarily housed in public shelter. Each of these dams will require fairly extensive repairs.

Spillover from the Sunset Reservoir required evacuation of about 2,000 people. Although homes in these areas have sustained surface-water damage, most of the evacuees returned to their residences the day after the earthquake.

Water Supply

The Hetch-Hetchy aqueducts have survived, as have the San Andreas and Crystal Springs reservoirs. The city water mains from San Jose northward have survived, except in the structurally poor ground bordering the Bay. In these areas, there has been extensive breaking of the mains; but the early closing of valves to these areas during the first two days after the quake has substantially reduced the loss of water. In other areas of the peninsula (except in Daly City, South San Francisco, and San Bruno, where there was extensive surface faulting), the water distribution system is mostly intact and operational. As of D+7, the areas of significant outage are along the bay, in Daly City and in San Bruno; where access has been

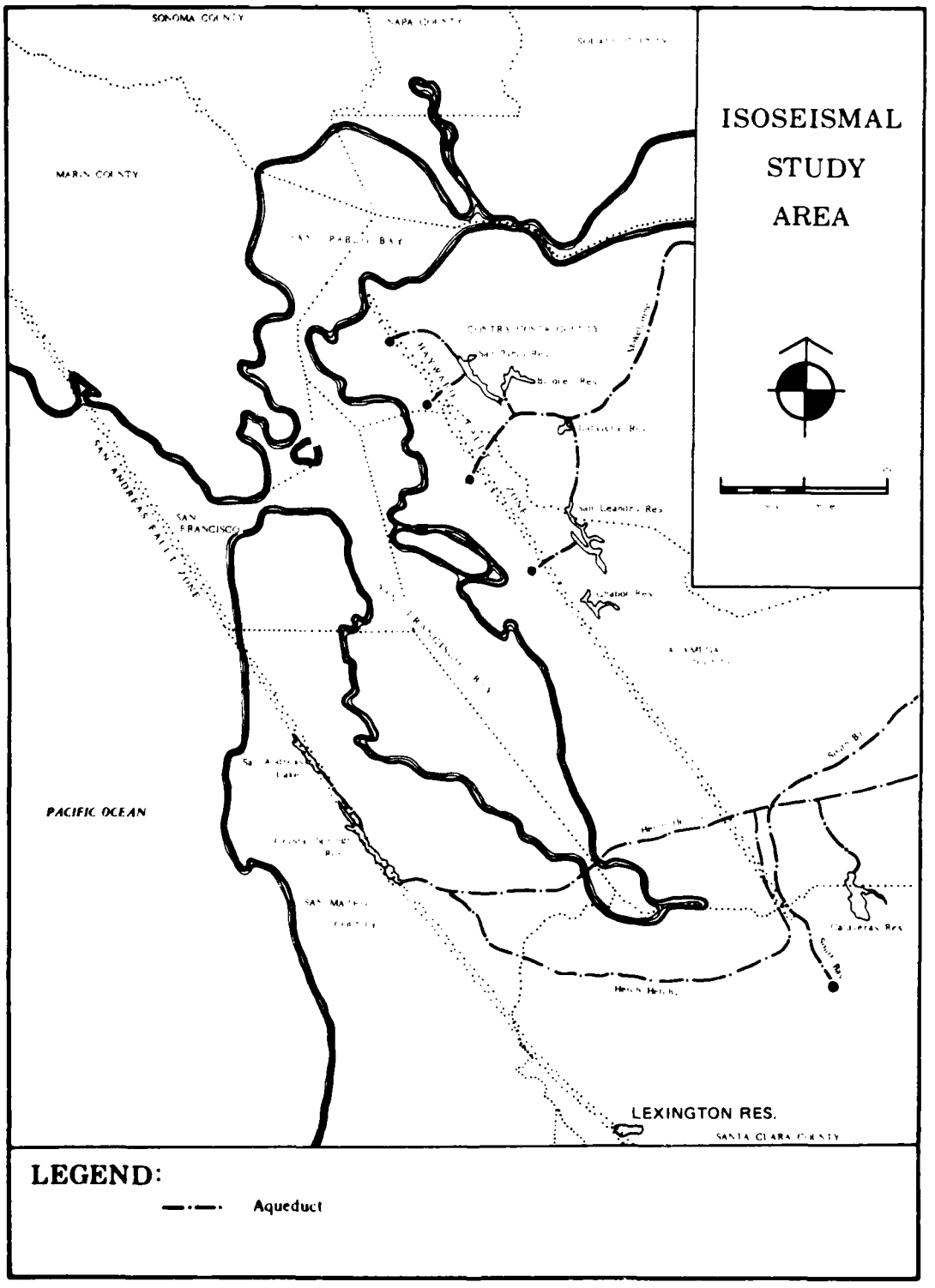


FIGURE A-7 MAJOR AQUEDUCTS AND RESERVOIRS

cleared the areas are being serviced by tanker trucks. An extremely critical fire hazard exists in these areas because of lack of water in the mains. It is estimated that water service can be restored to most of these areas in about 1 month, if sufficient piping, fittings, couplings, machinery, and manpower can be obtained for laying temporary, above-ground lines A similar pattern exists along the East Bay. The conduits from the Sierra Nevada and the storage reservoirs have survived. The only breakage of water mains has been in the structurally poor ground west of Route 17. Closing of valves to these mains has reduced the loss of water. The most serious water shortages are in Newark, Alameda, Richmond, and the western portions of Hayward, San Leandro, San Lorenzo, Oakland, and Berkeley. It is estimated that service can be restored to most of these areas in 4 to 6 weeks, if sufficient supplies and manpower can be obtained for laying temporary, above-ground lines.

Since the occurrence of the earthquake, people have been advised over EBS to boil or disinfect all drinking water before consumption. Because of the broken sanitary sewer mains and damaged sewage treatment plants, there is considerable raw sewage on the ground and in the bay, and there is a significant danger of typhoid if proper precautions are not taken.

Sewer Systems

The pattern of rupture of sewer lines is similar to that of water mains, i.e., breakages were concentrated primarily in areas of poor ground and surface faulting. These were in the fill areas around the bay (east of Route 101 and west of Route 17) and in the Daly City-San Bruno area. Twenty-five of the approximately 40 sewage treatment plants built on fill land around the bay are severely damaged. As of D+7, it is estimated that those along the west side of the bay will be out of operation for at least a year and those along the East Bay will be out of operation for 6 to 12 months. As an expedient emergency measure, open trenches are being dug to allow the raw sewage to flow directly into the bay and the Pacific Ocean until the treatment plants and sewer lines can be repaired. It is estimated that about

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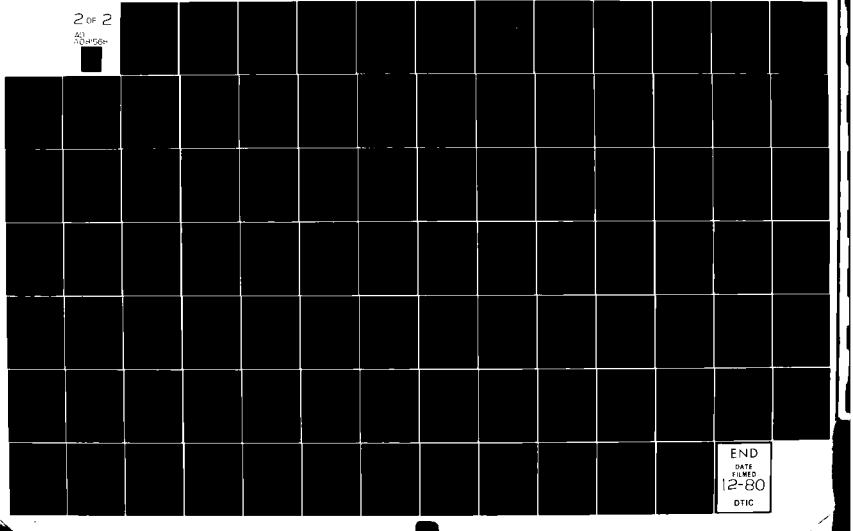

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two-thirds of the raw sewage produced in San Francisco, San Mateo, and Santa Clara Counties and about one-fourth of that produced in Alameda and Contra Costa Counties will be discharged into the Bay for the next several months.

Electric Service

As of D+7, there is still no electric service in San Francisco, San Mateo, Santa Clara, and southern Marin Counties, except for facilities with emergency standby generators. The power-generating facilities serving these areas are not expected to become operational for at least 2 weeks. Repair of transmission lines, transformers, poles, switchgear, etc., is expected to be completed and service restored to all areas of these four counties in about 30 days, except for the heavily damaged areas east of Route 101 and in Daly City. Service into these areas will be restored on an as-needed basis for the reconstruction effort.

In the East Bay, there was no loss of power-generating facilities; and only one major transmission line, the one coming northward along the Bay from San Jose to Oakland, became tangled and damaged. Electric service to all cities along the East Bay was out during the first 12 hours and then was gradually restored from the east to the west. As of D+7, service has been restored to virtually all areas east of Route 17 and to a few selected areas west of Route 17 in San Leandro, Alameda, and Richmond. At the present time, it is anticipated that service will be restored to most East Bay areas in 2 weeks.

Radio and Television

Immediately following the earthquake, all TV and most radio stations in San Francisco and San Mateo counties were out of operation for 24 hours because of facility damage and in-house power supply and transmission line problems. However, two EBS radio stations with standby emergency generators were back on the air in about 3 hours. In Santa Clara, Alameda, Contra

Costa, and Marin Counties, all of the television stations and about one-fourth of the radio stations were off the air during the first 6 to 12 hours, primarily because of loss of commercial power. Radio stations with standby emergency generators in these areas (primarily EBS stations) were back on the air in less than an hour. These were the radio stations in San Jose and the greater Concord area. They broadcast early EBS messages (as provided by the California OES at Concord) to the six most affected counties immediately surrounding the Bay.

As of D+7, no television transmitting stations are in operation in San Francisco, San Mateo, and Alameda counties, primarily because of damage to facilities and lack of commercial power. Two are in operation in Santa Clara County. However, at least 50% of the radio stations in the six-county area are back in normal operation. Full restoration of radio and TV service is not expected for at least a month.

Emergency Radio Services

Immediately after the earthquake, the fire, police, hospital, public utility, special service, and CB radio services encountered considerable trouble and confusion because of temporary outages at the control stations (due to seismic damage and delay in start-up of emergency generators) and because of overloading of frequencies.

As of D+7, much of this difficulty has been overcome, and the emergency services are considering the emergency acquisition and use of taxis for local mobility and communications.

Telephone Systems

As of D+7, 75% of the telephone system is out of service in San Francisco, San Mateo, and southern Marin Counties, and about 25% of the

system is out of service in Santa Clara, Alameda, and western Contra Costa Counties. Line-load control is in effect throughout the area. It is estimated that service will be restored to most of the East and South Bay areas in 2 to 4 weeks and to most of San Francisco and San Mateo Counties in 1 to 2 months.

Natural Gas

Transmission lines along both sides of San Francisco Bay (east of Route 101 and west of Route 17) have fractured because of ground failure. Distribution system breaks occurred in virtually the same pattern as those in the water distribution system indicated previously. Because of the many breaks in the system and other damaged facilities, service to San Francisco and San Mateo Counties was cut off and, as of D+7, is not expected to be restored for at least 30 days. In Santa Clara County, gas has been restored to 50% of the area, and full service is expected in 2 to 4 weeks. In Alameda and Contra Costa Counties, service has been restored to all areas east of Route 17, and full restoration is expected west of Route 17 in about a month.

Petroleum Pipeline

Immediately after the earthquake, the pumping of petroleum products into the Bay Area was discontinued, pending a survey of all pipelines. As of D+7, several lines appear to have been damaged, particularly those crossing the structurally poor ground in the marshland regions around the shorelines of San Francisco Bay. To date, no fires appear to have been caused by petroleum pipeline failures. Pumping has resumed in the petroleum lines east of Route 17, but is not expected to extend farther westward for at least 4 to 6 weeks.

As of D+7, a rough estimate of the cost for restoring utilities is two billion dollars.

Impact on Medical Services

Incidences of fatalities and injuries among medical personnel were similar to those of the public at large. Damage effects on hospitals, clinics, nursing homes, medical supplies, etc., were comparable to those presented relating to the impact on dwelling and commercial structures. Other factors with adverse impacts on emergency medical care services during the first several days after the earthquake related to: (1) transportation problems in getting medical personnel, casualties, and supplies to functioning hospitals and first aid stations; (2) lack of water and commercial power; (3) acute shortage of medical dressings, medicines, and inoculations; (4) shortage of food; (5) incidence of fire; (6) surviving casualties buried under debris; and (7) the general confusion, anxiety, mental disorders, and widespread trauma existing among the public at large, particularly as the many aftershocks continued to rock the area. Damage to medical resources is summarized in Table A-9.

Before the disaster there were 85 hospitals with about 21,000 beds and 240 nursing homes with about 23,000 beds in the six counties surrounding the Bay. The damage to hospitals and related facilities was widespread. Overall, in the nine-county area, the damage has averaged about 25% of the hospitals' replacement value. In San Francisco, San Mateo, Santa Clara, and Marin Counties, damage exceeded 50% of the replacement value of the hospitals; in Alameda County it was about 20%. In Contra Costa, Napa, and Solano counties, hospital damage generally amounted to 10% to 15%. More than half of the hospital beds were lost in the six-county area. In San Francisco, San Mateo, Santa Clara, and Marin Counties, over 70% of the hospital beds were lost. In Alameda County, bed losses were about 20% and less than 15% in Contra Costa County. Loss of beds in nursing homes was generally in the same ratio. As of D+7, it is estimated that repair/restoration of the damaged hospitals will cost approximately $1 billion.

Of the approximately 11,000 physicians and surgeons and 26,000 registered nurses in the area, about 2% became fatalities. Further,

Table A-9

MEDICAL RESOURCES AND LOSSES (APPROXIMATE) AT D+7

a. Facilities

	No. of Hospitals Before Disaster†	No. of Hospital Beds Before Disaster*	No. of Hospital Beds After Disaster	No. of Nursing Homes Before Disaster†	Nursing Home Bed Capacity Before Disaster*	Nursing Home Bed Capacity After Disaster	Emergency Hospital Beds	
							HRDI	PDI
Alameda	26	4,742	3,760	83	6,169	4,920	400	600
Contra Costa	10	1,838	1,700	35	2,795	2,580	500	200
Marin	7	776	290	14	1,143	430	150	0
San Francisco	19	7,032	2,140	27	2,365	720	0	0
San Mateo	10	2,611	560	25	2,041	480	200	500
Santa Clara	13	4,234	1,400	56	8,341	2,830	50	400
Total	85	21,233	9,850	240	22,854	11,960	1,300	1,700

b. Personnel

	Physicians and Surgeons Before Disaster	Registered Nurses Before Disaster	*Percent of Med. Pers. Killed and Long-Term Casualty*	*Percent of Med. Pers. Avbl for Duty at D+7*
Alameda	2,200	5,550	0.9%	95%
Contra Costa	950	3,150	0.5	98
Marin	900	1,700	0.8	97
San Francisco	2,800	5,100	1.3	94
San Mateo	1,150	3,700	0.8	97
Santa Clara	2,700	7,000	0.7	97
Total	10,700	26,150		

†California Statistical Abstract, 1978, p. 55.

*California Statistical Abstract, 1978, p. 58.

approximately 1% of the area's medical personnel were so seriously injured that they were not able to function during the first 7 days. Another 6% of these personnel were unable to report for duty during the first 3 days because of transportation and other problems. As of D+7, about half of the injured medical personnel have returned to duty at least part time; and 94% to 98% of the medical staffs are back on duty. Adding to the overall casualty care load, the extensive quake damage to the hospitals themselves resulted in more than 1,000 deaths and over 8,000 injuries.

Medical supplies and some of the more seriously injured persons were brought into the Bay Area hospitals that have heliports located on the grounds. Other hospitals roped off an area of the parking lot for this purpose San Francisco hospitals are not as well equipped to handle supplies and the injured via helicopter because of the lack of space for helicopter landings. As of D+7, casualties with long-term severe injuries are being taken out of the area by helicopter. Figure A-8 indicates major hospitals and hospital heliports.

In the six-county area, approximately 15% of the pharmacy stocks of medical supplies and 25% of the wholesale stocks of drugs and other medical supplies were destroyed by the earthquake and subsequent fire. The Irwin Memorial Blood Bank in San Francisco and the Peninsula Memorial Blood Bank in Burlingame were severely damaged, as well as the blood plasma centers; and they are still out of service at D+7. The other five blood banks are in serviceable condition, and, as of D+7, are in operation. Many of the available package disaster hospital (PDH) units and the hospital reserve disaster inventory (HRDI) modules have survived.* As of D+7 days, emergency hospitals have been set up, primarily in school gymnasiums. As indicated in Table A-9, about 3,000 additional hospital beds available from these sources.

*Medical supplies and equipment previously made available to local governments by federal and state agencies for prepositioning and use during emergency situations following disasters.

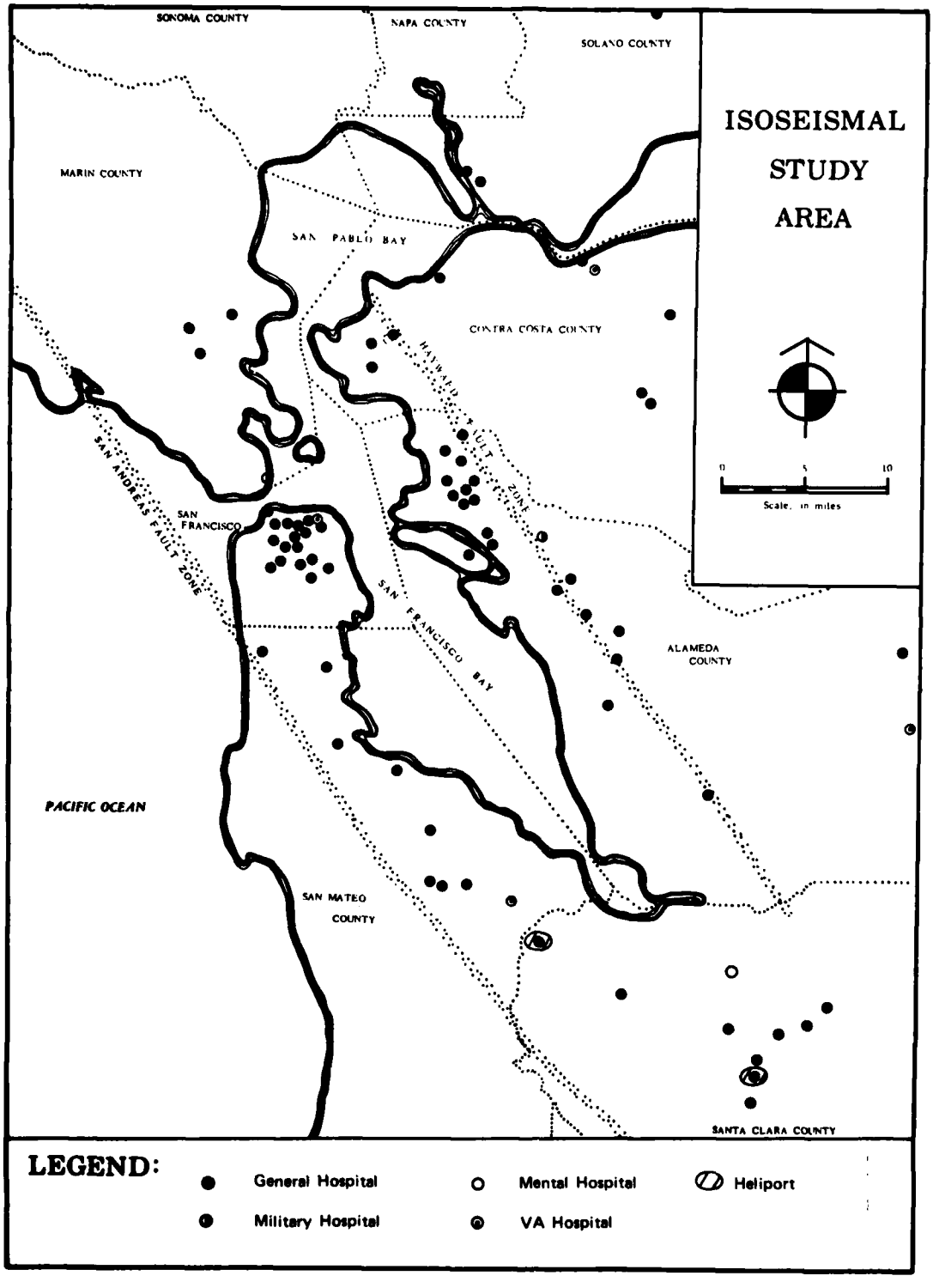

FIGURE A-8 MEDICAL FACILITIES – MAJOR HOSPITALS

However, in many instances, the emergency electric generators had previously been taken from the packaged disaster hospitals for other local government use and thus were not available for use at these improvised hospitals. The medicines were generally missing and much of the other equipment in the PDHs was of marginal value. Therefore, this resource was of very limited value for medical care purposes.

Total Magnitude of Reconstruction Effort

As of D+7, the rough first approximation of the costs to repair and/or replace damaged and destroyed facilities (in 1979 dollars) is as follows:

Residential units	$ 5 billion
Industrial/commercial facilities	7 billion
Transportation	10 billion
Utilities	2 billion
Medical resources	1 billion
Total	$25 billion

In addition to the structural and facility damage indicated above, tens of thousands of redwood and eucalyptus trees have been uprooted on both public and privately owned land in Marin, San Francisco, San Mateo, and Santa Clara counties. As of D+7, few of these have been cleared away.

Appendix B

ISSUES REQUIRING MULTIJURISDICTIONAL DECISIONS

Appendix B

ISSUES REQUIRING MULTIJURISDICTIONAL DECISIONS

The earthquake scenario described in Section II of Volume I and in Appendix A represents the greatest natural disaster that has ever occurred in the United States in terms of fatalities, casualties, and property damage. To those directly affected by death, serious injury, and loss of property the impact is tragic. The impact on local government, commerce, and industry is also significant. However, on the positive side the vast majority of the people have survived with little or no injury, and less than 10% of the area's total resources has been lost. Also, a major disaster of this nature provides a unique opportunity to design the reconstruction of the damaged urban areas so that they can be safer, more efficient, and more attractive, can provide better and more equitable access to locations and services, and can attract selected businesses and industries, thereby increasing the employment and tax base.

The following goals could be set to guide reconstruction activities:

- Ensure early return to the normal and familiar.
- Reduce future earthquake vulnerability through strict land use control and through damage mitigation via rigorous building codes and earthquake-resistant design and construction procedures.
- Seek opportunities for improving the economic efficiency, social access, and physical appearance of the affected urban areas.

There are conflicts in these goals. With more than 100,000 people homeless, more than 50,000 casualties still requiring medical care, the output of goods and services in many localities reduced almost to zero, and approximately a million people out of work in the six county area, there is great pressure to proceed rapidly with reconstruction unhampered by land use controls or building construction restrictions. On the other hand, to make

the reconstructed area safer, more efficient and attractive, and more viable than before the disaster requires extensive comprehensive planning, greater resources of all types (material, financial, technical, and administrative), and most of all, more time than would an unplanned, expedient reconstruction effort.

However, a lengthy time lag between the disaster and the initiation of reconstruction tends to increase the level of uncertainty, social disruption, frustration, and pressure from the disaster victims. According to Kates,

> Excessive uncertainty exacerbates the social and psychological disruption of the victims, slows reconstruction, and leads to wasteful duplication and squandering of resources and to frustration of basically sensible plans for better and safer reconstructed cities. In the pressurized atmosphere of reconstruction, flexibility or careful examination of alternatives should yield to early decisions and widespread dissemination of information about such decisions. Each individual act of reconstruction needs to be scrutinized for how it adds to the overall burden of uncertainty and indecisions, and what is prudent and sensible in normal times may appear luxurious in the special circumstances.*

Thus, prolonged and ambitious planning is counterproductive, and the temptation is strong to respond rapidly to the immediate needs of the disaster victims. Following the 1906 San Francisco earthquake, the ambitious Burnham reconstruction plan was rejected and replaced with essentially no plan--thus planting the seeds for the injury and damage statistics characterizing the previous scenario.

Inevitably, the actual achievement will be less in practice than the potential opportunity for change offered by the disaster. The "planner" will always want more time; but in the real post-disaster world, compromises must be made. A moratorium on all reconstruction and/or rebuilding is

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*Hass, J. Eugene et al., Reconstruction Following Disaster, Cambridge, Massachusetts, The MIT Press, 1977.

desirable until decisionmakers can reach a consensus on such major issues as future land use controls and building codes. However, such a moratorium is difficult to enforce and cannot be maintained for more than a few weeks at best.

The broad spectrum of assistance available from federal and state sources does facilitate the reconstruction effort; but, as demonstrated in the 1964 Alaska earthquake, there are major problems in setting priorities and in establishing a mechanism for allocation of assistance. The problems that will require decisions and actions by publicand private-sector officials are described in the following pages. They are grouped under the following broad headings: reconstruction policies and priorities, leadership roles, coordination of critical emergency functions, transitional governance, phasing of people-serving activities, and physical reconstruction activities.

Reconstruction Policies and Priorities

Policies

Perhaps the most important and the most difficult decisions of local officials--with local citizen advisory input and with the advice and guidance of state and federal officials and the private sector--will relate to future land use plans, zoning, and building codes and the enforcement of restrictions concerning reconstruction. For example, a decision to forbid the repair of earthquake damage or the future construction of homes and/or industrial/commercial facilities (1) on the filled marshlands around the Bay, (2) on the areas subject to excessive landslides, and (3) on and immediately around the San Andreas Fault, would confront decisionmakers with many problems, such as:

- The delineation of set-aside areas, including hundreds of thousands of acres of land that have for decades been used for residential, commercial, and industrial purposes.

- The establishment of procedures for acquiring the land from the present owners.
- The source of funding to acquire the set-aside land.
- The adjudication of appeals from the present landowners.
- The loss of tax base and revenue through dispossession of the landowners.
- The relocation of the displaced homeowners, businesses, and industries, possibly to other jurisdictions, resulting in permanent loss of local tax base and jobs.
- The future use of the set-aside land--possibly as recreational park land, forest land, or agricultural land.

Similarly, decisions by the local government policymakers to mitigate future seismic damage through more restrictive building codes than now exist will prolong the total reconstruction effort. Such decisions also will add significantly to the overall cost because of the additional material, technical, and administrative expenses associated with earthquake-resistant construction as compared with normal construction.

Most important, far-reaching decisions of this nature and magnitude cannot be made (or certainly should not be made) unilaterally by each individual city or county in the Bay Area. These are the types of decisions that should be made collectively by the top executive officials of the Bay Area governments, working as a unit, with appropriate input from local industry and representative citizen advisory groups, and with advice and guidance from cognizant state and federal officials as well as seismic technicians and construction specialists. Unfortunately, one of the major constraints is time. These will likely be the most important and far-reaching decisions formulated by the policymakers in the post-disaster reorganization period. If consensus cannot be reached in 4 to 6 weeks, it is unlikely that land use or building code changes can be made. Again, according to Kates:

> If too much time is taken to study, design or administer; if the changes proposed are overly ambitious; or if the plans are grandiose and lead to uncertainty, conflict and further delay, then failure follows. The plans are not executed.

Normally, following a disaster the Red Cross, Salvation Army, and other human services agencies administer the collection and distribution of gifts and donations among the disaster victims. However, following a disaster of this magnitude, unprecedented donations and gifts from around the world are likely to come pouring in. Government officials, probably at the state level, may have to make decisions concerning equitable allocation among the jurisdictions (9 counties and approximately 50 affected cities). Local officials may have to make similar decisions concerning the allocation of these items within their jurisdictions and the provision of assistance in the distribution of the items.

Priorities

Once agreement is reached on land use and building code modifications, decisionmakers are faced with the problem of establishing priorities for the scheduling of the various construction projects. These decisions must be made during the first month or so after the disaster and rigorously enforced. Otherwise, the result is likely to be cosmetic patching of the damage, causing a substantial increase in future vulnerability, and the emergence of shanty towns. During the first year or so after the disaster, construction costs will soar, materials of all types will be in short supply, skilled labor and contractors will be scarce, and pressures for limited resources will come from all sides. Therefore, the overall construction effort must be scheduled at a rate compatible with the availability of construction manpower, equipment, and supplies and consistent with established priorities.

An initial approach to establishing priorities for rebuilding might be based on geographic areas, categorized into four zones:

- The set-aside, high-risk areas, where reconstruction will be prohibited.
- The areas where reconstruction is to be delayed pending further study.

- The areas where restoration will be allowed, but only with permit and strictly in accordance with the new seismic-resistant building regulations and housing codes generally agreed upon by the Bay Area governments.

- The areas where restoration will be permitted without strict supervision, but still in accordance with the new codes. These are areas where homes and commercial and industrial facilities have suffered only superficial damage, requiring minimum repair.

Over and above this initial geographic approach, local decisionmakers may wish to assign priority to reconstruction projects that are important to the area's viability or to the public well-being, such as:

- Restoration of basic utilities (water, sewerage, electricity, gas, and telephone) to homes and facilities with little or no damage. Allocation of manpower and supplies for expedient, temporary, above-ground conduits to these locations should be given a high priority and the services should be extended to other buildings as soon as they are sufficiently repaired or restored to accommodate them. However, before utilities are restored to any building, manpower must be allocated to inspect thoroughly the condition of all pipes and wiring (particularly gas and electric) and to make the repairs required to avoid the danger of explosion and fire when gas and electricity are turned back on at their sources. Also, expedient, temporary arrangements must be made to handle sanitary and storm sewage, even if nothing more, initially, than open ditches draining the sewage to the bay and the ocean. Obviously, as more equipment, technical manpower, and resources become available, permanent utility installations would be scheduled on a priority basis.

- Early restoration of industrial/commercial economic activities. As of D+7, the loss of output is almost 90% in San Francisco County, 75% in San Mateo County, 50% in Santa Clara County, and 25% in Alameda County, with comparable increases in numbers unemployed (Table B-1). The economic impacts of this damage include the loss of tax revenues for local jurisdictions, the loss of earnings for the individuals involved, and the loss of profits for the businesses and industries. Also, there are adverse psychological impacts on individuals and their families as a result of prolonged unemployment. In the less-damaged areas, resumption of utilities and repairs of the minor damage will restore commercial and industrial facilities to operable condition. However, for these facilities to resume operations, at least a minimal transportation network must be restored. In the heavily damaged, set-aside areas, relocation of commercial and industrial facilities will be required. If it is not possible to relocate them within the same political jurisdiction, or if the firms choose to leave the area, both tax

base and jobs will be lost. Decisions regarding priorities must reflect these trade-offs. Finally, the sheer magnitude of the industrial or commercial reconstruction effort (estimated at $7 billion in 1979 dollars) will force local government and private sector decisionmakers into priority scheduling simply because everything cannot be done at once.

Table B-1

UNEMPLOYMENT CAUSED BY THE EARTHQUAKE

County	No. Employed Before Event	No. Employed After Event	Unemployed Number	Unemployed Percent
Alameda	467,200	350,400	116,800	25.0
San Francisco	537,700	53,800	483,900	90.0
San Mateo	238,900	119,500	119,400	50.0
Santa Clara	587,900	440,900	147,000	25.0
Total	1,831,700	964,600	867,100	47.3

Leadership Roles

State Government

On D+1 the Governor flew to the Disaster Field Office at the Presidio to direct the use of state personnel and resources; he continued to maintain executive control of disaster relief operations. Early in the post-disaster period, however, decisions will have to be made concerning the state's role during the reorganization period. The decisions relate to the type and characteristics of the leadership or assistance that the state should provide in the following areas:

- The availability of the national guard to aid local jurisdictions to maintain law and order and the policies regarding reimbursement for services.*
- Development of a coordinated, multijurisdictional land use plan for the reconstruction period.
- Development of standardized building regulations and housing codes across the nine-county area for reconstruction and rebuilding.

- Inspection and enforcement functions related to the adopted building regulations and housing codes.
- Reorganization of local governments or government functions, including the merger of smaller cities into a single metropolitan entity, where such action is deemed desirable.
- Relocation of residential areas and industrial parks from highly seismic-prone areas to areas of lesser risk, including areas in other parts of the state or in other states.
- Suspension or modification of laws to facilitate the application of available resources to reconstruction.

Specifically, should the state be prepared to abrogate local government authority if local officials are unable or unwilling to take the actions regarded as desirable to ensure a regional approach to reconstruction? What steps will the state take to ensure a coordinated federal/state approach to the reconstruction effort? To what extent should there be suspensions or revisions of the laws relating to advertisement for bids for supplies or services; to public health, safety, zoning, or entrastate transportation; or to the conduct of private or public business?

Federal Government

Following a disaster of this magnitude, the federal government will have to make major decisions such as:

- When and at what rate should the assistance of federal troops and/or military police be withdrawn from the area?* How should the phase-out of this assistance be coordinated with the phase-out of the National Guard?
- Will the federal agencies provide the stimulus and leadership to obtain standardized, multijurisdictional land use plans and building restrictions; or will they deal with each local jurisdiction unilaterally; or will they leave these decisions entirely up to local governments without advice or guidance from federal levels

*In the scenario described in Appendix A, martial law was not invoked by the Governor. However, the National Guard was made available at local request, presumably for the duration of the emergency.

regarding earthquake hazard mitigation? How will federal and state policies of this type be coordinated?

- Will the federal government require that the state and/or local governments develop an earthquake hazard mitigation plan, and will the approval of local applications for assistance be withheld unless such plans are rigorously implemented?

- Will the federal government insist that reconstruction of bridges, roads, airports, and railways be carried out in accordance with the best and latest technology in earthquake-resistant construction?

- Will project application and review regulations and procedures be relaxed to expedite restoration and reconstruction?

- Will the federal agencies require "energy-efficient" reconstruction based on practical use of solar radiation and effective insulation?

- Will environmental controls be rigidly enforced, or relaxed at least temporarily?

- Will the federal government provide leadership in the elimination of substandard housing?

- In the restoration of BART, will the federal government insist that this facility be extended to the San Francisco International Airport?

- Will the federal government provide leadership and initiative in the implementation of local decisions?

Requests for direct assistance and for approval of project applications from the 9 counties and the approximately 50 cities that have suffered extensive damage may at times exceed the current authorizations allocated to each of the federal agencies processing such requests. Under these situations the federal agencies may have to make decisions concerning the priority needs or the relative degree of urgency among the many jurisdictions whose requests exceed the currently available supplies. Also, at times, the federal agencies--in particular, the FEMA Region IX Director--may have to make decisions concerning the scheduling of assistance over a longer period

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*In the scenario presented in Appendix A, martial law was not requested because civil courts and authorities had not ceased functioning. However, federal military and was requested for perimeter control.

of time. The allocation of resources at too rapid a rate would tend to be wasteful and counterproductive. A mechanism will need to be established to ensure that priorities and scheduling decisions are consistent with those established by the state.

Local Government

A major responsibility of local governments is the provision of public safety services in their jurisdictions. For those supplementing their forces with National Guard personnel, a decision will be required regarding the continuation of this assistance. But perhaps the most difficult decisions relate to land use planning and building code development and enforcement for which they also have responsibility within their jurisdictions. It has become apparent during the first week after the disaster that massive assistance is needed from the outside to cope with the necessary reconstruction. The overall economic, sociological, and environmental problems following the disaster will necessitate decisionmaking and coordinated action on an areawide basis--in particular, policies concerning future land use, building regulations, housing codes, environmental controls, utilities, transportation, industrial and commercial facilities, etc.

The immediate decisions required of local government in this area relate to the extent to which current roles and responsibilities are exercised directly or assigned to another jurisdiction. For example:

- Should legislative or regulatory changes be made regarding the confiscation and allocation of privately owned resources?
- What incentives or inducements should be given to industry and business officials to encourage them to rebuild and restore their facilities as soon as feasible?
- What priorities should be established in the phased allocation of essential construction resources to the various businesses and industries? To residential properties?
- Should the established building codes and reconstruction restrictions be at least temporarily relaxed for those businesses and

industries that employ large numbers of people or whose products and/or services are important to the overall reconstruction effort? Should similar concessions be made to individuals to facilitate housing reconstruction?

- Should local government assist business, industry, or individuals in locating and moving to seismically safer areas, even if it means moving to another jurisdiction? What revenue sources should be tapped?

- How should local government interact with federal and state government agencies in this effort?

Regional Agencies

Several regional agencies with varying responsibilities for land use planning currently exist in the Bay Area--the Association of Bay Area Governments (ABAG), the Bay Conservation and Development Commission (BCDC), and the California Coastal Commission. ABAG is a voluntary agency, and not all local governments are members; it does not have the authority to enforce land use recommendations. The other two agencies have such authority but only for limited geographic areas--land along the coastline or the waterfront of San Francisco Bay. Given the extent of the disaster, consideration might be given to strengthening these agencies or to adopting other approaches to increase the capacity for regional decisionmaking, such as:

- Merging neighboring cities merge into larger jurisdictional units, particularly where there are economic and sociological advantages for such mergers.

- Forming metro governments with total local government authority and responsibility vested exclusively in the county government.

- Establishing limited-function countywide or regional governments (e.g., functions confined to land use planning and building code development and enforcement).

Private Sector

The private sector consists of a wide variety of entities that can contribute to recovery in many ways. The jobs they provide are essential to the economic recovery and viability of the area. But some, such as construction companies, contribute directly to the physical reconstruction effort; others, such as retail, service, financial, and other entities, provide necessary goods and services to the indigenous population and others from outside the area who are assisting in reconstruction.

The private sector has critical leadership roles to play in the recovery process. Because of the fragmented nature of some industries--e.g., construction--and the need to mobilize and schedule the use of available resources according to priorities set by government, an existing organization or newly formed committee should assume responsibility for inventorying resources and working with the appropriate authorities to ensure their effective allocation. Similar leadership activities are required in each of the major people-serving activities, such as retail goods and services, particularly food, banking, and others. Again, it will be critical to take a regional perspective to ensure the provision of essential goods and services as required, with return to predisaster conditions only as resources can be made available.

Although the early restoration of the economic base is a high-priority goal, it may be in the best interests of some companies to relocate or consolidate their operations outside the Bay Area, either for seismic safety reasons or because of the length of time required for reestablishment of operations. Close collaboration of company executives and government leaders will be required to ensure an optimal balance of private-sector and public-sector interests.

Coordination of Critical Emergency Functions

Early restoration of fire, police, rescue, and public health services is a top priority to prevent or minimize further loss of life and property and to preserve law and order. Comprehensive public information is also essential during the recovery/reconstruction period. These functions are being provided as of D+7 and need to be continued on a coordinated basis until they can be handled be local government in the predisaster mode. Some of the specific issues that need to be considered are presented below.

Emergency Public Information

It is extremely important to keep the general public fully advised at all times concerning the magnitude and extent of the disaster, specific actions that should be taken to minimize further loss of life and damage to property, and decisions made by authorities that will influence the lives and well-being of the people affected by the disaster. Following a disaster of this magnitude, the people look to their government officials for information and leadership. If local government officials fail in this responsibility, rumor leads to chaos; chaos leads to anarchy; local authority is abrogated; and the state and/or federal governments have no option but to take over. Thus, emergency public information is essential to allay the fears of the disaster victims and to restore confidence in local government. However, important decisions will have to be made, such as:

- Who will be responsible for drafting public information releases that relate to reorganization and policies concerning reconstruction?
- On whose authority will these broadcasts be made and who determines their content: the Mayor, City Manager, Chief of Police, state or federal authorities?
- What officials will be authorized to speak for the local chief executive officer in these matters?
- With commercial power still not restored, what actions will be taken to ensure broad dissemination of these messages?

- How will detailed information concerning fatalities and other casualties be disseminated?
- Since local newspapers are not being published, how will this void temporarily be filled?
- What action will be taken to encourage the early restoration of printing of local newspapers in the area?
- What actions will be taken to "squelch" rumors?
- What will be the roles of state and federal governments for emergency public information in the disaster area during the reorganization/reconstruction period?.
- Will there be any attempt to control or manage the commercial radio broadcasts from the disaster area, other than local programming over EBS?
- Will efforts be made to prepare standardized news reports for release to the rest of the country?
- Will efforts be made to keep the news media out of the disaster area and, if so, for how long?

Law Enforcement

Since D+1, a dusk-to-dawn curfew has been in effect, and large numbers of National Guard troops have been assisting local police (at local government request) in maintaining law and order. Local officials will be required to make difficult decisions concerning the level of control to be maintained, the severity of punishment for violations, and whether or not to ask for Federal Military Pclice support in this mission. Since D+1, and with assistance from Federal Military Police (at the Governor's request), perimeter access control has been maintained to keep unauthorized personnel out of the disaster area. Soon after D+7, government officials will have to decide when this tight control can be relaxed, who may have access to the area and how soon, and whether Federal Military Police should be used for other law enforcement functions. Local governments will also have to decide whether or not to deputize local citizens.

Medical Care

As of D+7, areawide there are almost 30,000 casualties still requiring hospitalization and another 28,000 requiring outpatient care. In San Francisco County, of the 6,500 still requiring hospitalization, about 10% have been evacuated from the area. This means that there are about 6,000 casualties still requiring hospitalization and 5,500 requiring outpatient care, with fewer than 2,000 hospital beds available. Improvised care centers have been set up in school buildings to provide temporary care for these casualties. Prior concentration on rescue and emergency on-the-spot life-saving actions and lack of hospital care facilities in the peripheral areas surrounding the disaster zone have impeded the evacuation of these casualties; as of D+7, a major medical care problem still exists. There are approximately 2,600 physicians and surgeons and 4,800 nurses available in the San Francisco area to treat the casualties and provide ongoing medical care for the 645,000 uninjured. Also, among these uninjured there is an increased incidence of mental instability because of the trauma of the past 7 days. Lack of electricity, water, and sanitary facilities and acute shortages of medical supplies are compounding the problem.

In Alameda County the problem is similar, but perhaps a bit more manageable. Of the 6,900 casualties requiring hospitalization, 25% have been evacuated to the east. This leaves about 5,200 in the areas west of Route 17 still requiring hospitalization, and about 6,500 requiring outpatient care. No more than 3,000 beds are available for these casualties. Approximately 2,100 physicians and 5,200 nurses are available in the Alameda County area to treat the casualties and provide ongoing medical care for the more than 1 million uninjured, including those suffering mental disorders. Shortages of medical supplies and utilities also prevail in Alameda County. Another complicating and compounding health factor is the widespread presence of raw sewage throughout the six-county area.

The 6th U.S. Army has been supplementing local efforts with emergency medical care, and DHEW has been making emergency distribution of medical supplies and equipment. However, this effort has been seriously impeded by

the transportation problems in the disaster area and the magnitude of the medical care situation. As of D+7, the Army is prepared to set up emergency field hospitals and evacuate the 30,000 casualties requiring hospitalization from the nine-county area. However, sites must be selected (1) where there is adequate ground area to set up the tent hospitals; (2) where there are the required utilities (electricily, water, sewerage); and (3) where there is ready access (roadway, airport runway, or heliport) for moving equipment, supplies, and patients into the area. The early selection of these sites and the commitment of supplies and logistical support require decisions and actions by federal, state, and local government officials--taking into account such factors as total logistical support and material requirements of the disaster area, the relative priority of this effort, and the attendant problems associated with the separation of the casualties from their relatives, friends, and familiar neighborhoods.

Care of the Homeless

As indicated above, there are 38,000 long-term homeless in the nine-county area, 18,400 of whom are in San Francisco and 2,400 in Alameda County. An additional 74,000 people are living in heavily damaged but repairable homes, 36,000 of whom are in San Francisco and 4,800 of whom are in Alameda County. In San Francisco, very few of the homeless have left the city because of the comparable housing situations in San Mateo and Santa Clara Counties to the south and the general absence of transportation to the north. About half of these homeless have temporarily moved in with friends and relatives, and the other half are in emergency feeding and mass-care shelters set up by the city and the welfare services in the less damaged areas of the city. In Alameda County, about 1,000 of the homeless have voluntarily moved out of the disaster area and have temporarily moved in with friends and relatives east of Route 17. The remaining 1,400 homeless in Alameda County are in emergency feeding and mass-care shelters set up by local governments and the American National Red Cross (ANRC) in Fremont, Hayward, San Leandro, Oakland, Alameda, Berkeley, and Richmond.

The major long-term-homeless problem (more than 36,000 people) is concentrated mainly in the Peninsula area (San Francisco, San Mateo, and Santa Clara Counties) and Alameda County. During the past 7 days these homeless have been domiciled in temporary--and in most cases austere--facilities. In the very near future, decisions must be made concerning the disposition of these people, who are likely to remain homeless for at least a year. If it is decided to move them from the damaged areas, the "Crisis Relocation Plans" of these counties should provide the basis for carrying out these actions. However, it must be recognized that these decisions should not be made by the federal, state, and local public officials alone. Because of the large numbers of homeless involved, input from the disaster victims is virtually mandatory if there is to be voluntary compliance with the decision(s). There are several options available to the decisionmakers, such as:

- Billeting the homeless with those in the immediate local area whose dwellings were not damaged (with proper reimbursement to the host families).
- Establishing tent villages within or surrounding the disaster area. Sixth U.S. Army can requisition prepositioned war stock and set up tent villages to accommodate all the homeless; but acreage must be located in an area that can be served from a logistical and utility standpoint. Also, the rigors of tent life during the winter rainy season must be considered, as well as the problems associated with the long-term separation of the homeless from their friends and relatives. Further, if such a tent village is established, what is the future and continuing role of the 6th U.S. Army in maintaining and policing this village?
- Establishing trailer (mobile home) parks in and around the disaster area where water, electrical, and sewer services are available.
- Moving people to other parts of the state or to neighboring states where surplus public or private housing can be leased for the homeless.
- Continuing to maintain and operate emergency feeding and mass-care shelters.

If the homeless are initially forced to evacuate from the disaster areas, local government officials will be faced with a serious near-term problem from those evacuees who insist that they be allowed to return

following the cessation of aftershocks to build a shanty or pitch a tent at the site of their destroyed or damaged homes or businesses in order to personally protect what is theirs or what can be salvaged.

In addition to policies concerning the long-term homeless, decisionmakers also must deal with the problems of the almost 75,000 other people who are living in dwellings that have been heavily damaged and are in need of extensive repairs. This problem will become increasingly more acute as the winter rains and cold weather set in. However, since repair of these homes is a component of the overall reconstruction program, it cannot be considered or dealt with in isolation. Therefore, this component of the homeless is included in the next section as an element of the overall reconstruction problem.

Disposition of the Dead

As of D+7, more than 10,000 bodies have been recovered. Under the direction of the 6th U.S. Army, most of the bodies are in storage in refrigerated Fleet Support Ships at Hunters Point. Approximately 3,000 have not yet been identified, but the effort is continuing. Of the more than 1,600 currently reported missing, many are likely also to be fatalities. Among the seriously injured, there also will be many more fatalities over the ensuing weeks. Disposition of these human remains is the responsibility of state and local governments, and decisions must be made by state and local officials concerning:

- How to dispose of the remains.
- The attempts to be made to locate and notify survivors.
- The kind of ceremony or religious services, if any, that will be conducted.
- The records to be maintained.

Transitional Governance

Critical emergency functions will be handled on a coordinated basis for some time, and will involve significant local government involvement. Efforts will also be focused on restoration of other government functions some of which are not normal in the predisaster sense. Some of the issues to be faced are summarized below.

Logistical Problems

In response to the many local requests following a disaster of this magnitude, there is an early temptation to move thousands of people (both military and civilian) into the damaged area to carry out emergency survival and recovery actions and to initiate the reorganization and reconstruction effort. However, each individual brought into the area must be fed, housed and otherwise provided for. The logistical support for these people must either be provided from local resources, which are already in acutely short supply, or be brought in from the outside. If brought in from the outside, transportation, access, and road space must be allocated to this effort. Support by persons from the outside is essential, but federal, state, and local officials will have to make decisions concerning the number and types of people required, where and when they are needed, and--most of all--the supplies that will be required to support them and the sources of these supplies.

Use of the Unemployed

Because of the extensive damage to industrial and commercial facilities and the disruption of transportation and utilities, almost 900,000 people have become unemployed. Local and state officials will have to make decisions concerning the productive use of this human resource, such as:

- How can the unemployed unskilled labor be identified and recruited from the damaged areas to assist in debris clearance, ditch digging, demolition, salvaging of usable materials, and other menial tasks?

- How can unemployed skilled construction workers be located and recruited to assist in rebuilding the damaged cities?

- How can the talents of the unemployed clerical office workers and professional people best be used in the reorganization effort, and how does one recruit them and assign them to their tasks?

- What should be the major role of the private sector and the unions (particularly the craft unions) in organizing and spearheading this effort?

- After these people have been put back to work on various recovery and restoration projects, how are they reimbursed for their efforts so that they may then purchase the necessities of life from the retail outlets that have been reopened?

- How is transportation arranged and provided to get these people to and from their new jobs?

- How will the transition be arranged and provided in order to get these people off "public works" projects and back into the private-sector labor market?

- On the other hand, how will local officials deal with the thousands of volunteers from the outside as well as from within the disaster areas who "jump in" and try to perfonm services on their own without any coordination of their efforts with local government?

Rationing and Other Controls

For most consumer items, demand is likely to exceed supply for varying periods of time, depending on the commodity, in the heavily damaged six-county area. As retail outlets begin to open in and around the damaged areas, some merchants are likely to take advantage of the situation and increase their prices exorbitantly--particularly for items such as fresh meats, vegetables, fruits, dairy products, drugs and medicines, building supplies, and fuel. This also may be the case with entrepreneurs or opportunists who transport urgently needed supplies into the disaster area for retail sale from their trucks. Local officials must discuss these issues as they develop and make decisions concerning:

- What items, if any, need to be rationed, and how can a rationing program be administered and controlled?
- What penalties will be imposed for black market operations?
- What constitutes unfair, exorbitant prices?
- How can prices and profits be controlled?
- What penalties will be imposed for profiteering?

As of D+7, the only item that has been controlled in the heavily damaged area is gasoline. However, this has not been difficult to control since most filling stations are still closed because of lack of electricity to operate their pumps. Route 82 has been open for emergency and authorized traffic only, and the damaged and debris-strewn streets have prevented people from driving their autos. Another factor that has kept personal driving reduced is simply that thousands of personally owned automobiles are still stranded on inaccessible portions of bridges, roadways, and elevated highways.

Phasing of Building Controls

Local government (or regional government, if one has been established) may have to make decisions concerning the phasing of building regulations and housing codes during the reconstruction period. For example, to expedite the return to normal, local government may initially permit cosmetic and superficial repairs to damaged structures, followed by more permanent repairs as soon as resources become available, and eventually require full implementation of the new building regulations and housing codes over a period of several years. However, if local government decides to use this phased approach, it must make many related decisions, such as:

- How liberal a policy will it adopt?
- Will it permit the use of corrugated sheet metal, scrap wood, and other unsightly repair materials?

- Will it inspect repaired structures and enforce safety standards? If so, what standards?
- Will it inspect repaired electrical, water, and gas fixtures? Will it routinely inspect elevators?
- Will it insist on provision for sanitary sewage disposal, and how?
- Will it permit the "temporary" building of shanty towns?
- How will it prevent the expedient and temporary from becoming permanent?

Emergency Generators

In the heavily damaged areas where commercial power has failed, hospitals, emergency broadcast stations, and essential emergency government facilities have been operating on emergency electric generators since shortly after the earthquake. During the past 7 days, fuel has been allocated for these generators by local governments, and it has been delivered by tank truck from supplies outside the damaged area. As of D+7, most of these generators are in need of maintenance, or they will soon break down. Local governments must find and commit personnel to the maintenance effort, as well as to the continued allocation and delivery of fuel.

Other Issues

In some jurisdictions where there has been extensive damage and where large areas have been set aside, it may be difficult to return to "normal," because of an inadequate revenue base. Consideration may need to be given to alternative structural configurations of local government. these could include various forms of regional government, consolidation of functions, or other alternatives.

Regardless of organizational decisions, there are a number of administrative issues that require consideration:

- What financial provisions should be made for local government employees until they can return to work? What funding arrangements are available?
- Should local government employees be reassigned from normal to emergency functions?
- Should private sector resources be appropriated for restoration of emergency services; and, if so, what reimbursement policies should be adopted?
- What administrative procedures should be established to apply for assistance and to allocate it within the jurisdiction?

Phasing of People-Serving Activities

Banks

Since the earthquake, many banks in the disaster area have been closed because of lack of utilities, structural damage, and concern over security. Early restoration of business and commerce is desirable, and local officials will have to make decisions and take appropriate actions to overcome the factors that are keeping the banks closed.

Retail Outlets

Most retail outlets closed immediately after the earthquake because of failure of utilities, damage to the buildings, and concern over security. At the urging of local government, beginning at D+4, the less damaged retail grocery stores and pharmacies were opened during daylight hours for the sale of canned and dried foods, first aid supplies, medicines, and drugs. As of D+7, this is continuing, and local officials must soon decide whether other retail outlets should be encouraged to resume business and, if so, under what conditions. In conjunction with such actions, local officials will have to make related decisions and allocate the required transportation to move supplies from warehouses to retail outlets and to obtain needed resupplies from the outside. Relevant to this resupply problem as of D+7, Route

82 is still the only major north-south route usable from San Jose northward across the Peninsula; and in the East Bay, Route 17 and many streets west of Route 17 to the bay are extensively damaged and of marginal use.

Wholesale Operations

As the retail outlets across the damaged areas begin to reopen for business, state, and local policymakers will have to make decisions regarding the reestablishment of wholesale operations. The decisions will relate to such factors as:

- Which wholesale operations are most important to the reorganization effort and what priority should be assigned in the order of reestablishment?
- How will wholesale supplies be shipped into the periphery of the damaged areas? What is the urgency--is use of air freight justified?
- How will supplies be transported to the wholesale warehouses inside the damaged areas?
- Should priority be assigned to the reestablishment of utilities to warehouses? If so, how does this rank in relation to hospitals, schools, retail outlets, industrial facilities, homes, etc.?
- Will the agreed-on building regulations and codes for reconstruction be rigorously enforced for warehouses and similar buildings or will they be "temporarily" relaxed, permitting makeshift and cosmetic repairs "for the time being"?

Schools

Immediately following the earthquake, all schools in the Bay Area were closed. Most students were in transit to school at the time of the earthquake. Those who were walking or on bicycles returned home on their own. Those in buses and cars encountered problems, but all were generally back to their homes (or in mass-care shelters with their parents) by the end of

D+1. All schools remained closed the rest of the week, until the buildings could be inspected for structural integrity. As of D+7, all schools have resumed operation in Solano and Napa Counties; and the majority in Sonoma and Contra Costa Counties are in operation, except in the western portions. School has not yet resumed in San Francisco and San Mateo Counties, in northern Santa Clara County, western Alameda County, and southern Marin County, and many of the school buildings in these counties are being used as mass-feeding and sheltering centers and as mass-casualty-care centers.

No schools have collapsed, but damage ranges from minor window breakage to moderate structural problems requiring extensive repairs. The moderately damaged schools are those on or near the San Andreas Fault on the Peninsula and those on former marshlands around the bay, which suffered excessive liquefaction. Restoration of utilities (water, gas, electricity, and sewerage) and replacement of broken windows is all that the majority of the schools require. With the scheduling of split or double sessions at the less damaged schools, all students could be accommodated; and decisions concerning the restoration or relocation of the more heavily damaged schools could be deferred. Early restoration of schools is important; but, in addition to the repair of building damage, local decisionmakers will be confronted with:

- The problems of debris clearance for access to the buildings.
- Transportation of students and faculty.
- Overall logistical support of the operation.

These decisions will, for the most part, be made by school authorities, but close coordination with other local officials will be required.

Physical Reconstruction Activities

Fires and Debris Clearance

By D+3, all urban fires resulting from the earthquake were extinguished; and since that time, local fire services (with assistance from the Forest Service, the 6th U.S. Army, and the Coast Guard) have been able to contain and extinguish all subsequent urban fires. However, as of D+7 there are still many forest/brush fires in the coastal range of San Mateo and Santa Clara Counties between Routes 92 and 17 and in Marin County south of the Petaluma-Bodega Bay area. The fires in the San Mateo-Santa Clara area are generally contained, and the Forest Service estimates that they will be extinguished within another week. The many fires in Marin County, being fought primarily by the Forest Service, the military, and state personnel are still raging; and there is no indication as to when they will be brought under control. With reference to both urban and rural fire areas, many decisions will have to be made by government officials, such as:

- Should the high-rise structures that have burned be restored or demolished?
- Should the agreed-on building regulations and codes for reconstruction restrict the future construction of high-rise structures in the more seismic-prone areas?
- Should regulations require all high-rise structures in the nine-county area to undertake extensive prescribed modifications in order to significantly reduce the likelihood of fire occurrence from future earthquakes?
- What priority should be assigned to control and extinguish the forest/brush fires in San Mateo, Santa Clara, and Marin Counties; and where will the additionally required manpower, equipment, and supplies come from?
- Should the burned-over rural areas be reseeded? If so, how soon, and by whom? Where will the supplies come from?
- Who will be responsible for decisions related to demolishing the burned-out buildings?
- Who will be responsible for removing the burned-out debris and other debris from the streets and from public and privately owned

property? Who will pay for debris removal from privately owned property?

- Where will dumps be set up for discarding the massive amounts of debris? Will debris be dumped into the bay under emergency authorization? Who makes this decision?

Restoration of Utilities

If local government is to maintain its integrity and viability, the early restoration of essential services is absolutely necessary. Restoration of utilities (electricity, gas, water, sewerage, telephone) was discussed above under "Priorities." The emphasis there was on providing temporary, expedient service on an "as-needed basis. However, decisions need to be made early in the reconstruction period regarding permanent installations, particularly their location relative to the major faults or structurally poor land around San Francisco Bay.

This is most important for sewage treatment facilities many of which are located adjacent to the bay. As of D+7, two-thirds of the raw sewage of the Peninsula area and one-fourth of that from Alameda and Contra Costa Counties is being discharged untreated into the bay and the ocean, because of the heavy and extensive damage to the many sewage treatment plants located on fill areas around the bay. The repair/restoration of the treatment plants is estimated to require 6 months or more on the East Bay side and 12 months or more along the West Bay. However, because of the severe health problem that this situation presents, government officials must make early decisions concerning the priority commitment of required resources to the repair/restoration of these facilities. For many of these plants a decision must be made whether to relocate them from the historic marshlands or to have them rebuilt in a more earthquake-resistant mode (to the extent of the state of the technology).

Toxic Materials and Hazardous Wastes

As a result of the earthquake, many above and below-ground storage containers have ruptured, causing local contamination problems from petroleum products, chemicals, and other toxic materials and hazardous wastes. These comprise both a fire and a health hazard. As of D+7, many such contaminated locations have been identified. Local government lenders must make decisions concerning the allocation of manpower and supplies either to clean up or to secure these contaminated locations. Also, they must make decisions on regulations and controls concerning the construction of containers for these materials in the future, as well as the future locations of storage sites.

Demolition of Buildings

Under the overall direction of the U.S. Army Corps of Engineers, a comprehensive effort to inspect damaged buildings, structures, and facilities for structural safety, and to determine and certify the need for demolishing them, has been under way since D+2. This effort is still under way, and several buildings have been identified. The Corps is prepared to proceed with the demolition, but only on the request of the local government. Therefore, local government officials will be required to make the final decisions on a building-by-building basis for each demolition, to inform building owners of such decisions, and to advise them concerning what assistance (if any) is available to defray rebuilding costs.

Repair/Restoration of Dwellings

Damage to and destruction of dwellings adversely affects more people in the disaster area than any other single factor. Therefore, large numbers of people (over 100,000 in this case) will be pressuring local policymakers for early decisions, for minimum building restrictions, and for priority allocation of equipment, manpower, and supplies related to the repair and

rebuilding of dwellings. If decisions have been made to forbid reconstruction in seismically unsound areas, new construction sites will have to be found for the relocatees. This may cause additional hardships and unhappiness for those who do not want to leave their old neighborhoods; other people may want to move permanently away from the earthquake-prone area to new jurisdictions. The repair/restoration of the damaged and destroyed dwellings represents a major effort (over $5 billion in 1979 dollars); and the scheduling of this effort will require carefully thought-out decisions by local officials, with input from citizens' advisory groups. The decisions obviously will be affected by many factors, such as:

- The earlier decision regarding the disposition of the long-term homeless.
- The availability of home construction resources.
- Enforcement of building restrictions and housing codes.
- The relative priority of this effort among all the other reconstruction efforts.

Repair/Restoration of Public Buildings

As was indicated in Appendix A, most of the office buildings occupied by the federal agencies in the Bay Area (particularly in San Francisco) were heavily damaged, some to the extent that they will probably have to be demolished. Buildings housing state government employees in the Bay Area were similarly damaged. As of D+7 or soon thereafter, federal and state officials must make short-range decisions concerning when their staffs can return to work and where--at least temporarily. Also, they must make longer-range decisions concerning the permanent locations of their offices, personnel, and facilities:

- Will they arrange to have their previously occupied buildings repaired/restored?
- Will these buildings be upgraded to mitigate future earthquake damage?

- Will the buildings in the areas more prone to earthquake damage (former marshlands) not be restored?

- Should a new Federal Center and a new State Center be built and the vast majority of federal and state operations and personnel relocated to the new center(s)? If so, where should it (they) be constructed, and what degree of earthquake-resistant construction design should be incorporated?

Restoration of Transportation Facilities

Local government and private-sector decisionmakers, with advice and guidance from state and federal officials, will have to determine which elements of the overall transportation services must be restored first; they will have to set realistic schedules for restoration; and they will have to allocate manpower, equipment, and supplies to do the job. However, prior to the establishment of these priorities, the policymakers will be faced with some extremely difficult decisions, such as:

- Will Route 280 be rebuilt along its present right-of-way adjoining the San Andreas Fault, or will it be relocated?

- Will Routes 101, 17, 37, and 237 be rebuilt along their present rights-of-way on fill land subject to liquefaction, or will these be relocated?

- Is the technology available, and can the funds be obtained, to make the Golden Gate and Bay Bridges virtually immune to further earthquake damage?

- Should the San Francisco and Oakland International Airports be relocated? If so, to where? And should they be combined into one facility serving both areas? Is adequate funding available; etc.?

- Should major additional expenditure of funds be allocated to the BART system to make it more earthquake damage resistant?

- Should the railroads be required to upgrade their facilities significantly to make them more earthquake resistant? If so, how will such upgrading be funded?

- The ports of San Francisco and Oakland obviously must be along the bay, and the reconstruction of these facilities also must be on the old tidal sloughs and marshlands. Should these facilities be

upgraded significantly to make them more earthquake resistant, and are there funds available to do the job?

- How soon can public transportation in the damaged areas be restored?
- How soon can the abandoned and isolated automobiles on bridges and along roadways be recovered, and what priority should be assigned to this effort?

The restoration of transportation throughout the area will require a considerable effort in terms of manpower, equipment, and supplies. In 1979 dollars, the estimated "replacement" cost is $10 billion. However, if new sites for Routes 280, 101, 37, and 237 and for the two major airports are to be procured, the total cost will be much higher; land acquisition for the relocated routes and facilities will be time-consuming; and greater amounts of construction resources will be required.

Repair/Restoration of Medical Facilities

The replacement cost of damaged/destroyed medical facilities in the Bay Area is likely to exceed $1 billion in 1979 dollars. The greatest damage is in San Francisco, San Mateo, Santa Clara, and western Alameda Counties. Decisions will have to be made regarding the appropriate priority to be assigned to this phase of the reconstruction effort and the degree of earthquake-resistant design (damage mitigation) that must go into the restored/reconstructed facilities; this requirement must be compatible with available funds and resources.

Appendix C

PUBLIC AND PRIVATE ENTITIES INVOLVED IN RECONSTRUCTION

Appendix C

PUBLIC AND PRIVATE ENTITIES INVOLVED IN RECONSTRUCTION

The issues described in Section III and Appendix B will require decisions to be made by a variety of organizations in the period following the immediate recovery. Some of these organizations are in the public sector, some in the private sector. It is not clear, however, which organizations will make the decisions on the various issues. In some cases no decision will be made, which is in itself a decision. In other cases there may be contests for influence or turf.

Just as citizens may feel that they should be free to follow predisaster laws in order quickly to restore their lives to predisaster conditions, so cities, for example, may believe they have the legal right, under laws in effect before the earthquake and still in effect, to make certain decisions. The state or federal government on the other hand, may believe that sensible recovery planning requires that certain decisions be made by an entity whose authority covers the entire area affected by the earthquake.

It would be a gross oversimplification, leading to decision errors, to think of any particular piece of land as being subject to a neat three layer government structure: the city, the state, the federal government. Hundreds of government organizations operate in the San Francisco Bay Area, as in similar areas throughout the country, and dozens of organizations may make decisions affecting a single neighborhood.

The extent to which governments make decisions or do not make them and the extent to which governments cooperate or act alone after a disaster,

will depend partly on advance planning, partly on the rigidity of traditional jurisdictional boundaries, and partly on the personal characteristics of the leaders in office at the time of the recovery process.

Classification of Entities

Federal Government

Federal government activities in the San Francisco Bay Area comprise a number of coordinating agencies and a variety of mission-oriented departments and independent agencies. The roles of these entities have been well defined for the immediate response period, but have not been clearly specified for the reconstruction period.

Coordinating Agencies

The Federal Emergency Management Agency (FEMA) is charged with the emergency deployment of resources that are used on a routine basis by federal agencies. It is also charged with coordination of state and local government, private industry, and voluntary organizational resources in an emergency. The agency coordinates federal activities to anticipate and prepare to respond to major civil emergencies. It performs functions previously assigned to the former Defense Civil Preparedness Agency (Department of Defense), the Federal Disaster Assistance Administration and the Federal Flood, Riot, and Crime Insurance Program (Housing and Urban Development), the Federal Preparedness Agency (General Services Administration), the Federal Emergency Broadcast System (Office of Science and Technology Policy), the U.S. Fire Administration and the National Academy for Fire Prevention and Control (Department of Commerce), and federal functions concerning earthquake hazards reduction, dam safety, weather-related emergency readiness plans, and natural and nuclear disaster warning systems. FEMA's role is primarily the coordination of the emergency response activities of federal agencies and liaison with state and local agencies. This role will

continue into the reconstruction period for as long as these activities are needed and may expand to include reconstruction functions, depending on the federal/state administrative structure established.

A Federal Regional Council has been established in each of the 10 standard federal regions. The councils are mandated to improve coordination of the categorical grant system and to develop closer working relationships among themselves and with state and local governments. Federal Regional Councils are composed of the principal regional officials of the Departments of Agriculture, Commerce, Education, Energy, Health and Human Services, Housing and Urban Development, Interior, Labor, and Transportation, and of the Community Services Administration and the Environmental Protection Agency. The President annually designates one member to serve as chairperson. An Undersecretaries Group for Regional Operations provides policy guidance. Many of these agencies would be actively involved in the recovery from a major earthquake. The coordination of federal reconstruction assistance might actually be assigned to the Federal Regional Council, particularly if the earthquake occurs in a regional headquarters city such as San Francisco.

Federal Executive Boards have been established in 26 metropolitan areas to improve internal federal management practices. They are composed of heads of federal field offices. A chairperson is elected annually by board members. Committees and task forces undertake projects of the boards, which receive overall policy direction from the Office of Management and Budget. ALthough the boards are not normally coordinating agencies and are internally oriented, in the case of recovery from a major earthquake, a federal executive board might act as a de facto coordinating body. This would be more likely for affected areas located outside a federal regional headquarters city.

Other Federal Departments and Independent Agencies

FEMA has overall responsibility for coordinating the federal response to a major disaster. Table C-1 summarizes the mission assignments of other federal agencies as specified in the current Federal Earthquake Response and Assistance Plan for the San Francisco Bay Area. Specific activities are described in the plan, and will be authorized by Mission Assignment Letters issued by the FEMA Regional Director after a formal Presidential Declaration of a major disaster.

These activities will continue as long as they are needed and authorized. As the emphasis shifts from emergency response to reconstruction some of these activities will be discontinued and others redefined, and agencies or parts of agencies not involved in the emergency response period will become active. For example, the Department of Labor's Occupational Safety and Health Administration will have continuing responsibilities (not just related to debris clearance), and other parts of the department, such as the Employment and Training Administration will become involved in facilitating reconstruction through their various labor-oriented programs.

Other agencies will be called on to support reconstruction functions when the administrative mechanism is established:

- Department of Energy
- Department of Housing and Urban Development
- Department of Education
- Department of the Treasury
- Small Business Administration
- Community Services Administration.

These and other agencies that will be involved reflect the needs for some controls on the use of scarce resources, for guidance on reconstruction policy, and for extensive financial assistance to individuals and public and private sector entities. Under normal conditions responsibilities of these

Table C-1

EMERGENCY SUPPORT FUNCTIONS

Federal Agencies	1 Emergency Transportation	2 Emergency Communications	3 Emergency Debris Clearance	4 Fire Fighting	5 Emergency Roads and Bridges	6 Emergency Demolition	7 Logistical Support	8 Emergency Medical Care	9 Search and Rescue	10 Identification and Disposal of Dead	11 Warnings of Risks and Hazards	12 Emergency Distribution of Medicine	13 Emergency Distribution of Food	14 Emergency Distribution of Consumable Supplies	15 Emergency Feeding and Mass Care Shelter	16 Damage Reconnaissance
DOT - FAA	S	S							S							
DOT - FHWA	S				S											
DOT - FRA	S															S
DOT - RETCO 9	P															
DOT - UMTA	S															S
DOT - USCG	S	S		S		S			S							S
DOD - 6th USA	S	S	S	S	S	S	S	P	P	P	S*	S	S	S	S	P
DOD - COE		S	P	S	P	P										
DOD - DCPA		S														
DA - USFS		S		P	S				S							
DA - FNS													P			
DOC - MARAD	S							S								
DOC-NOAA-NWS		S														
ANRC - SA								S				S			P	
DOI - USGS		S														
DHEW							S					P			S	
DOJ										S						
DOL - OSHA						S										
EPA			S			S										
FBI										S						
FCC		S														
GSA	S	S			S	S	P					S		P		
ICC	S											S	S	S		
NCS		P									P*					
SA-CRWRC-MDS															S	
USPS	S															
VA								S				S	S		S	

Note: P = principal agencies
S = support agencies
* = Assumed

Source: Federal Emergency Management Agency, "Federal Plan for Earthquake Response and Assistance (San Francisco Bay Area)," Annex C, San Francisco, 1979.

agencies are constrained by statute and budget. To meet the massive requirements occasioned by the earthquake, the budget constraints will have to be modified and some statutory changes may be required. Decisions on these issues will require assessment of requirements, evaluation of resources (federal, state and local), and determination of the administrative procedures for meeting the requirements.

State of California

As for the federal government, state agencies can be classified as coordinating and line or mission agencies. Functional roles are well defined for emergency response but not for reconstruction.

Coordinating Agencies

The Office of the Governor includes an Office of Planning and Research which performs long-range planning, coordinates the activities of state, local, and federal agencies, provides research assistance to the Governor on state and local government matters, and operates the State Clearinghouse, which coordinates the review of all federal grant applications by state and local agencies as well as of selected environmental documents. In addition to being chief executive of the state and responsible for directing most state departments and agencies within the executive branch, the Governor serves as Commander-in-Chief of the California National Guard. He is responsible for declaring a state of extreme emergency and disaster and for mobilizing and directing state resources during emergency situations. In a disaster of the magnitude postulated, the Governor can be expected to play an active role in setting goals and priorities for reconstruction and in guiding the reconstruction effort.

The Office of Emergency Services (OES), under the direction of the Governor, is responsible for developing and maintaining state plans and programs necessary to mitigate the effects of natural, man-made or war-caused emergencies that result in conditions imperiling lives, property and resources within the state. The OES works with state, federal, and local agencies to ensure that preparedness plans and programs are integrated and compatible. During an emergency, the OES is responsible for coordinating mutual aid provided by state agencies and other organizations in supporting local government emergency operations. The OES also administers federal programs that provide financial and program assistance for disaster planning and recovery. The OES includes divisions for fire and rescue, emergency assistance, utilities, planning, telecommunications, radiological and nuclear civil protection, and law enforcement. The San Francisco Bay Area is included within Region II of OES, with regional offices in Concord, about 15 miles from San Francisco and outside the primary earthquake impact area.

A related agency, the California Emergency Council, acts as an advisory body to the Governor in times of emergency, and considers, recommends and assists him on policy determinations regarding the state's plans and programs to mitigate the effects of emergencies.

The California Coastal Commission was established by the California Coastal Act of 1976 which specified coastal conservation and development policies. The commission assists local governments along the coast in bringing plans into conformity with the policies of the new land law and in some cases assists in regulating development within the coastal jurisdiction outlined in the law. Much of the area affected by the earthquake falls within the Coastal Commission's jurisdiction, and the agency's policies will affect land use decisions made to facilitate or guide reconstruction.

The California Commission for Economic Development, chaired by the Lieutenant Governor, develops policy and programs for improving the state's economic climate. It conducts or sponsors special studies concerning the state's economic climate and business conditions and makes recommendations

to the legislature on these matters. The agency may provide policy inputs to the process of determining reconstruction priorities.

The San Francisco Bay Conservation and Development Commission (BCDC), part of the state Resources Agency, is charged with the protection of the public interest in San Francisco Bay as a natural resource. It provides a means by which the Bay system can be analyzed, planned, and regulated. The commission exercises its planning function through a staff of planners and consultants, and exercises its regulatory function by a permit system for bay filling projects and for some land use changes within a 100 foot band along the bay shore. This agency as well as the Coastal Commission should provide inputs to land use decisions regarding waterfront land.

The Seismic Safety Commission, established in 1974, is mandated to work toward higher levels of seismic safety. It coordinates existing programs and initiates new legislative or administrative measures to deal with the continuing earthquake problem. Its technical input will be essential to the determination of building code modifications covering repair of existing structures and construction of new buildings.

Other State Departments and Agencies

Table C-2 shows the mission assignments for the various state agencies actively involved in emergency response. As in the case of the federal government these activities will continue as required and will be modified or expanded, if appropriate, to facilitate the reconstruction effort.

Agencies not heavily involved in the immediate response period will also become important to the reconstruction effort. The California Housing Finance Agency, for example, can provide assistance to individuals and local public and private sector organizations in the provision of housing. The agency sells state revenue bonds to assist low- and moderate-income homeowners and renters by providing below market interest loans. The loans may be made to nonprofit and limited dividend sponsor/developers for rental

TABLE C-2
MISSION ASSIGNMENTS
FOR STATE AGENCIES

EMERGENCY SUPPORT FUNCTION

STATE AGENCY	SITREP & DAMAGE ASSESSMENT	FIRE & RESCUE	LAW ENFORCEMENT	DISASTER MEDICAL CARE	EMERGENCY PUBLIC HEALTH	MORTUARY SERVICES	RESOURCES & SUPPORT	General Support	Emergency Debris Clearance	Manpower	Transportation	Utilities	DISASTER FIELD OFFICES	DISASTER ASSISTANCE CENTERS	INDIVIDUAL ASSISTANCE
AGING	o														
AIR RESOURCES BOARD	o			o		o									
ALCOHOLIC BEVERAGE CONTROL BOARD	o		o												
BENEFIT PAYMENTS	o					o							o	o	
CALIFORNIA CONSERVATION CORPS	o	o					o	o							
CALIFORNIA HIGHWAY PATROL	o		o					o							
CALIFORNIA MARITIME ACADEMY	o			o				o							
CONSERVATION	o					o									
CONSUMER AFFAIRS	o												o	o	
CORRECTIONS	o	o	o	o		o		o							
EDUCATION	o					o									
EMPLOYMENT DEVELOPMENT	o							P					o	o	
ENERGY COMMISSION	o					o			o						
FINANCE	o					o									
FIRE MARSHAL	o	o													
FISH & GAME	o	o	o			o									
FOOD & AGRICULTURE	o			o											
FORESTRY	o	o	o		o			o							
FRANCHISE TAX BOARD	o												o	o	
GENERAL SERVICES	o		o			o	o		o					o	
HEALTH	o			P	P	P									
HOUSING & COMMUNITY DEVELOPMENT	o												o	o	
INDUSTRIAL RELATIONS	o					o									
JUSTICE	o		o			o									
MILITARY	o	o	o	o	o		o	o	o	o	o				
MOTOR VEHICLES	o				o										
NAVIGATION & OCEAN DEVELOPMENT	o							o							
OFFICE OF EMERGENCY SERVICES	P	P	P			P	P	P	P	P	P	P	P	P	
PARKS & RECREATION	o				o										
PERSONNEL BOARD	o						o								
PUBLIC UTILITIES COMMISSION	o							o	o						
REAL ESTATE	o													o	
REHABILITATION	o			o											
SOLID WASTE MANAGEMENT BOARD	o			o											
TRANSPORTATION	o		o			o	o	o	o				o		
VETERANS AFFAIRS	o			o	o										
WATER RESOURCES	o					o	o		o						
WATER RESOURCES CONTROL BOARD	o			o											
YOUTH AUTHORITY	o	o		o	o			o							

Note: P - Indicates agency with the primary or lead responsibility
o - Indicates agency with a support responsibility

Source: Emergency Plan, State of California, Office of Emergency Services, (Looseleaf, updated as required).

housing and to homeowners for the purchase and/or rehabilitation of owner occupied single family residences. In addition, the agency can provide loan insurance and bond insurance and enter into agreements with local governments, private lenders, and private mortgage insurance companies to provide loans and loan insurance to help rehabilitate designated neighborhoods. The agency's programs should be coordinated with those available from federal sources to ensure optimal use of available assistance.

The Department of Economic and Business Development will also become involved in the efforts associated with the recovery of private sector economic activities. The department is the primary state agency responsible for promoting economic development and assisting California and foreign businesses active in international trade. Its Office of Business and Industrial Development acts as an ombudsman between business and state government, assists in the location of business, and advises the Governor and the Secretary of the Business and Transportation Agency, of which it is a part, of problems facing the business community. The Office of Local Economic Development administers business financing programs and offers technical assistance to local economic development organizations. The Office of Small Business Development provides technical and management assistance to small business and operates a small business loan program.

Counties

The San Francisco Bay Area is considered to be the area within the nine counties of San Francisco, Santa Clara, San Mateo, Alameda, Contra Costa, Marin, Napa, Solano, and Sonoma. In all counties, some officials are responsible to the electorate and others are appointed by the executive. However, the counties follow a variety of organizational patterns which would affect the way in which resources would be mobilized for reconstruction. Two are listed below as illustrative.

Alameda County

Separately elected officials in the County of Alameda include members of the Board of Supervisors, judges, the sheriff, treasurer-tax collector, assessor, auditor-controller, clerk-recorder, and district attorney. Departments under the County Administrative Officer include those for the county counsel, clerk of the Board of Supervisors, personnel, planning, registrar of voters, public defender, general services, health care, public works, social services, probation, library, coroner, farm advisor, weights and measures, and data processing.

The City and County of San Francisco

The diversity of power in the City and County of San Francisco is demonstrated by the large number of elected officers. In addition to the Mayor, other officers directly elected by the voters include members of the Board of Supervisors, judges, the district attorney, sheriff, public defender, city attorney, and treasurer. Departments under the Chief Administrative Officer include public works, public health, purchasing, governmental services, electricity, and the coroner. Commissions include those for aging, airports, art, Asian art, city planning, civil services, fire, health services, housing, human rights, parking, permit appeals, police, port, public library, public utilities, recreation and parks, redevelopment, relation appeals, retirement, social services, status of women, war memorial, and waste water.

Cities

The San Francisco Bay Area includes 93 cities within the 9 counties. The County of San Francisco includes only one city, San Francisco, which is coterminous with the county, thus forming the City and County of San Francisco. On the other hand, Alameda County includes the 13 cities of Alameda, Albany, Berkeley, Emeryville, Fremont, Hayward, Livermore, Newark, Oakland,

Piedmont, Pleasanton, San Leandro, and Union City. Within these cities the organization and service patterns vary widely. The structure in San Francisco is outlined above. Two additional examples are listed below as illustrative:

Oakland

In Oakland, voters elect a mayor and other members of the City Council, and a city auditor. A city manager, appointed by the City Council, is responsible for the operation of departments that cover police, fire, public works, general services, personnel, economic development and employment, parks and recreation, community development, finance, city planning, data processing, library, retirement systems, and museum.

Berkeley

Voters elect a mayor, members of the City Council and a city auditor, as in the case of Oakland. The city administration includes the Office of the City Manager and the departments of: public works, police, fire, health, housing and development, planning, finance, personnel, law, and the city clerk.

Schools

Within the San Francisco Bay Area there are 182 school districts and 14 community college districts. The pattern varies with respect to other jurisdictions. Some school districts are coterminous with cities, many others are not. The City and County of San Francisco has only one school district. The school districts in Alameda County are listed below as illustrative of a more common county pattern.

- Elementary School Districts: Mountain House, Murray, Pleasanton, Sunol Glen.
- High School Districts: Hayward Union High School District (debt service but no operations), Amador Valley High School District.
- Unified School Districts (service both elementary and high school students): Albany, Berkeley, Castro Valley, Emery, Fremont, Hayward, Livermore Valley, Newark, New Haven, Oakland, Piedmont, San Leandro, and San Lorenzo.
- Community College Districts: Fremont-Newark Community College District, Peralta Community College District, South County Joint Community College District.

Special Districts

In addition to receiving government services from general purpose governments such as the federal, state, county, and city governments and from the school systems, citizens also receive government services from a large number of special districts that provide widely varying services. In the San Francisco Bay Area, 692 special districts have been created, some of which exist only on paper and are no longer active. But many provide vital services, some of which would be extremely important either in the immediate response to an earthquake or in the recovery period. Special districts, for example, provide some areas with water, fire protection, and transportation services. However, there is no readily-available map relating functions and geographic areas that could be used in assessing reconstruction resources and planning their allocation.

The special districts and other special government forms for Alameda County are listed below as illustrative of both the number and variety of this governmental mechanism:

- Community Service Districts. The Dublin-San Ramon Services District provides fire, recreation and park, and waste disposal services jointly with Contra Costa County. Improvement District #1 finances recreation and park services, (debt service only).
- Fire Protection Districts: They exist in Castro Valley, DeCoto, Eden, Fairview, Redwood, and Tennyson.

- Air Pollution District: Bay Area Pollution Control District (jointly with eight other counties).

- Flood Control and Water Conservation Districts. Alameda Flood Control and Water Conservation Districts.

- Hospital Districts: Eden Township and Washington Township hospital districts.

- Mosquito Abatement Districts. Alameda County Mosquito Abatement District.

- Recreation and Park Districts. East Bay Regional Park District (jointly with Contra Costa County), Hayward Area Recreation and Park District, and Livermore Area Recreation and Park District.

- Sanitary Districts (waste disposal): Castro Valley, Oro Loma, and Union.

- County Service Areas. There are nine county service areas, four providing fire service, two providing library service, two providing street lighting, and one providing road service.

- Resource Conservation District (soil conservation): Alameda County Resource Conservation District.

- Transit Districts: Alameda-Contra Costa Transit District (jointly with Contra Costa County); San Francisco Bay Area Rapid Transit District (jointly with Contra Costa and San Francisco Counties).

- Municipal Utility District (water and waste disposal): East Bay Municipal Utility District (jointly with Contra Costa County).

- County Water District: Alameda County Water District.

- Joint Exercise of Powers: Alameda-Contra Costa Health Systems Agency; Alameda County Solid Waste Management Authority; Alameda County Training and Employment Board; Alameda Regional Criminal Justice Planning Board; Associated Community Action Program; Association of Bay Area Governments; Bay Delta Resource Recovery Demonstration; East Bay Dischargers Authority; East Bay Emergency Medical Services; Livermore-Amador Valley Water Management Authority; Management Institute; Washington Hospital Authority.

- Community Redevelopment and Housing Agencies: Berkeley, Fremont, Hayward, Oakland, San Leandro, and Emeryville.

- Transporation Planning: Metropolitan Transportation Commission.

- Non-Profit Corporations (government-owned): Alameda County/Dublin Library Corporation; City of Berkeley Sather Gate Garage Corporation; Fremont Civic Center Corporation; Fremont Community Facilities Corporation; City of Hayward Civic Center Corporation; City of Livermore Recreation Corporation; Livermore Valley Unified School District Educational Facilities Corporation; Newark Unified School District Building Corporation; Oakland-Alameda County Coliseum Incorporated; City of Oakland-Clay Street Garage Corporation; City of Pleasanton Public Facilities Corporation.

Quasi Public and Volunteer Organizations

The American National Red Cross, Salvation Army and a variety of religious and other volunteer groups will be heavily involved in assisting individuals and families during the period immediately following the earthquake. To the extent feasible the services of these organizations should be used to supplement the activities of government in the reconstruction period, since "people problems" can be expected to continue for some time.

Private Establishments

Much of the work during the recovery process will be done by the private sector. Many of the decisions on the basic recovery issues will be made through an accumulation of individual decisions within the private sector, which is even less cohesive than the governmental sector. In various communities some leadership is exerted by a Chamber of Commerce, but in many places alternative organizations are being formed because the Chambers are so broadly supported that they have limited focus. Likewise, trade associations provide some unifying force within various activities, but there is a limit to how unified a trade association can be in a competitive atmosphere. In the stressful period of recovery following an earthquake, Chambers of Commerce and trade associations are even less likely to be able to provide unity as their members find themselves too busy to spend much time on broad problems.

Thus individual decisions will become especially important, and they will occur in a great variety of places. In Alameda County alone there are more than 22,000 business establishments employing nearly 325,000 persons, according to the most recently published figures from the Bureau of the Census. Their recovery is important both because they provide employment and income to residents of the Bay Area and because they distribute many of the goods and services essential to recovery. To facilitate long term recovery, however, reconstruction priorities may have to be set based on an "essentiality" rating system rather than on employment considerations. Private sector direct involvement and cooperation will be needed from the beginning to ensure the restoration of essential activities and the gradual reconstruction of other private sector facilities.

The following discussion on the various portions of the private sector uses, for illustrative purposes, figures for Alameda County taken from County Business Patterns, 1977, published by the U.S. Bureau of the Census in July 1979. Other counties could expect to be concerned with the same problems.

Construction

Much of the task of recovery from an earthquake will fall on construction contractors who will have far more work available to them than they can handle. In the absence of legal or very persuasive instructions from a government, they are likely to make priority decisions on the basis of who pays the most money, who asks first, who may provide long range work, who can be stalled for a while without going elsewhere, and who one's friends are.

There are 550 general building contractors in Alameda County. They will need to rely heavily on some 968 special trade contractors, including plumbing, heating, electrical, carpentry, roofing, and concrete contractors. Many of these potential subcontractors will have more than enough work to do as prime contractors in their own areas of concentration, and may be hard to

sign up as subcontractors unless some form of centralized scheduling of construction activities has been established. With major damage to roads, the county's 29 highway and street construction contractors will have plenty of work as will its 56 other heavy construction contractors. Again, scheduling of their participation will be necessary.

Many contractors rely heavily on union halls to supply construction tradesmen for specific jobs. For large jobs these tradesmen may, under normal conditions, travel long distances; they may not have this flexibility in the early stages of recovery. The unions, therefore, will have a critical role to play in facilitating the provision of skilled labor for the reconstruction effort.

Finance

In Alameda County there are 2300 establishments in finance, insurance, and real estate. Recovery will depend heavily on the availability of funds to provide both long term and short term financing of the necessary improvements. The weekly payroll (for all establishments) of more than $80 million in the county will have been significantly reduced with the earthquake, and the temporary closure of banks will have magnified the short term financial problems of residents. The extensive reconstruction will also generate major demands for long term financing.

Key in the process will be the 190 banking establishments, the 346 credit agencies other than banks, including savings and loan associations, credit unions, and mortgage bankers, and perhaps the 32 security and commodity brokers. They will have assistance from federal agencies listed previously, but some means for pooling resources and making them available in an orderly fashion and according to predetermined priorities will be necessary. Although this would take place to some extent in any event because many establishments are branches of larger institutions, government involvement may be necessary to facilitate joint planning by the major institutions.

Insurance carriers may be able to assist in long term financing, but decisions would be made for the most part by headquarters offices and in conjunction with financial institutions rather than by local insurance carriers or agents. Real estate companies may be able to assist in ascertaining the condition and availability of real estate. Since there are more than 11,000 establishments in the county, procedures for coordinating their inputs would be required.

Utilities

Although water and sewerage services are typically supplied by public agencies, other essential services are provided by the private sector. Electricity, gas, telephone, telegraph and other communications are provided through nearly 100 private establishments. Great pressures will be exerted by other portions of the private sector to provide interim services essential to recovery and to reestablish permanent facilities on a high priority basis. Reconstruction efforts of private and public sectors will need to be closely coordinated.

Transportation

The nature and speed of the recovery is likely to depend significantly on the provision of transportation. Although government agencies operate much of the mass transit, significant transportation is provided by the private sector. Goods are moved primarily by private carriers, so that trucking (both local and long distance), freight forwarding, rail service, air transport, and water transport are all dependent on the private sector. Nearly 500 establishments are involved in these activities in Alameda County.

Significant cooperation will be needed between transportation firms, governmental agencies, and the contractors engaged in the massive reconstruction effort because of the critical interrelationships between

transportation, construction activities, and the reestablishment of government and private sector activities. This will involve coordination with suppliers outside the area to ensure arrival of essential supplies on schedule.

Services

The "services" category includes a wide variety of activities provided, in Alameda County alone, by more than 7,000 establishments, most of them small--more than 80% employ less than 10 persons. Key services to be provided by the private sector during both the immediate response period and the recovery period are health services. As indicated in Section II, physicians and other health practitioners will have been mobilized to handle the pressing demands resulting from the earthquake, using temporary facilities as required. A high priority will be assigned to repair or reconstruction of hospital facilities and to the effective use of the 24,000 persons involved in the provision of health services.

Personnel supply services (including employment agencies and temporary help services) of which there are nearly 90 in the county, can assist government agencies during recovery in the location of skilled personnel and the placement of people who are unemployed because of damage to the buildings where they worked or inability of their employers to reestablish their businesses. Significant shifts in employment are likely to occur in the recovery period as people move from their pre-disaster jobs to recovery activities and then back to permanent jobs again. Both public and private resources will be needed to facilitate these shifts.

Private security services (more than 40 companies employing 25,000 persons) are also likely to be in high demand because of the potential for looting of damaged buildings or of new construction and the inability of the regular police forces to meet the above-normal requirements. Coordination of these private and public resources--including those maintained by private companies--would be desirable.

There will also be strong demand for auto repair services to repair and maintain both essential equipment and the thousands of private vehicles damaged in the earthquake. These services are widely distributed throughout Alameda county in the more than 400 automotive repair shops and in companies or government agencies employing their own mechanics.

Other business and personal services will be reestablished as the need develops and financing and construction materials and labor become available. Depending on the level of control built into the reconstruction process, these activities may be subject to priorities.

Manufacturing

In terms of employment and income manufacturing is an important activity. There are 1,900 establishments employing more than 84,000 persons in Alameda County. The extent to which facilities have been damaged or the ability to transport supplies or finished products has been impaired would be a function of location, but there will be strong pressure to get them operating as quickly as possible. Initial priority may be assigned to facilities with minor damage or to those defined as essential, e.g., food products manufacturing or petroleum refining.

Wholesale Trade

Wholesaling activities are essential to the efficient distribution of products to intermediate or ultimate consumers. In Alameda County there are 1,900 establishments employing nearly 28,000 persons. The county is an important center for grocery and food product wholesale operations--213 establishments employing more than 4,000 persons are located there. It is expected that considerable damage will be experienced by these food-related operations because of their concentration in the area of structurally poor ground west of Highway 17. Their repair or reconstruction--possibly in other locations--is important to the long term recovery of the Bay Area.

Other wholesale operations may receive priorities, such as lumber and construction materials, electrical goods, hardware, plumbing and heating equipment, and other products important to reconstruction.

Retail Trade

Once immediate response meeds have been met, it will be important to reestablish normal retail activities, again on a priority basis reflecting demand by locality and urgency of needs, e.g., food, drugs, clothing, gasoline, building materials, and other merchandise. In severely damaged areas, a coordinated approach, at least by the major chains, may be necessary to speed the response to consumer needs consistent with the availability of reconstruction resources.

Entities Related to Issues

The pattern of entities, public and private, is clearly very complex and relatively uncoordinated. In normal times, this pattern works and provides relatively good, relatively efficient government and distribution of goods and services to the American people. In a time of recovery from disaster, however, the usual checks and reconsiderations and corrections would not operate as well--considerations other than equity would predominate, and lost opportunities would be likely to remain lost. Nevertheless, the skills of people in the various entities would be massively brought to bear on the issues. The quality of the results will depend in part on the basic organization, sense of mission, and procedures of the entities, and in part on the quality of the people who happen at the time to be in positions of leadership.

Leadership Roles

Leaders in the recovery/reconstruction period might not be the same as the leaders during the immediate response period. Immediately after the earthquake, leadership is most likely to be provided by FEMA, the Office of Emergency Services, the Sixth Army, and the Governor personally. It is possible that the president or the governor or both jointly would appoint a leader--a "czar"--whose name would command respect, to be coordinator of response to the earthquake. However, because of time pressures and the ability of existing agencies to provide an effective immediate response, it is more likely that such an appointment would be made to facilitate mobilization and allocation of resources for reconstruction.

This approach was used following the Alaskan Earthquake in 1964 when President Lyndon B. Johnson created by executive order the Federal Reconstruction and Development Planning Commission for Alaska and appointed Senator Clinton P. Anderson of New Mexico as Chairman. In the case of a California disaster, the state will assume a major leadership role and appointment of a state cochairman is likely. Major inputs are also likely by such organizations as the Association of Bay Area Governments, the Federal Regional Council and a private sector coordination group.

Reconstruction Policies and Priorities

A variety of entities are likely to be involved in resolving the issues described in Section III and in proposing and adopting policies and priorities in such areas as land use, building codes and scheduling in order to promote high-quality reconstruction that is less vulnerable to future earthquakes. Among the entities are likely to be the Governor's Office, California Emergency Council, the Seismic Safety Commission, Office of Emergency Services, the State Fire Marshal, FEMA, Federal Regional Council, various state and federal agencies, representatives of the private sector, and county and city planning staffs and commissions. In practice, these policies and priorities will be determined on an iterative basis starting with

a small group representing state and federal leadership and then broadening the representation to include other stakeholders.

Coordination of Critical Emergency Services and Transitional Governance

A large number of entities will be concerned with resolving issues associated with the period of transition from emergency to "normal" conditions. Medical care issues will be of concern to county and city health departments, private medical practitioners, hospital districts, the State Department of Health Services, the U.S. PubLic Health Service, and the Veterans Administration. Issues regarding the homeless will be the concern of city housing departments, school districts, the Housing and Urban Development Department, and the Community Services Administration. Handling of the dead will be of concern to local coroners, mortuaries and operators of cemeteries (including the VA). Law enforcement issues will be of concern to city police departments, county sheriffs, the California Highway Patrol and Military Department, the National Guard, the Department of Defense, and many private protective services. Rationing may be of concern to the Department of Energy and FEMA. Issues regarding the phasing of building controls may be of concern to city councils, city managers, and local building officials. Issues relative to the use of unemployed will be the concern of the State Employment Development Department, local Comprehensive Employment and Training Act (CETA) offices, and the Department of Labor. Assistance from the outside is likely to be of concern to VISTA (Volunteers in Service to America), the American National Red Cross, and a variety of federal and state agencies augmenting their forces. The logistic problems of supplying the area will be of concern to private sector entities and the General Services Administration.

Phasing of People-Serving Activities

Issues regarding the restoration of service by retail outlets and by wholesale operations are primarily the concern of private entities, subject

to whatever priorities are established by government mandate or mutual agreement. With respect to food distribution, the Department of Agriculture and health agencies at all levels are likely to be involved. Restoration of banking facilities will involve not only the private sector but the U.S. Treasury, the Federal Deposit Insurance Corporation and the Federal Reserve Bank. Restoration of educational facilities will be primarily a concern of school districts with guidance and assistance from both state and federal departments of education.

Physical Reconstruction

Overall economic recovery issues will be of concern to private sector property owners and construction contractors, and to the California Commission on Economic Development, the Department of Economic and Business Development, the California Housing Finance Agency, the Department of General Services, the U.S. Department of Commerce and the Small Business Administration. Reconstruction of utilities and transportation issues will be primarily of concern to the major private utilities, the various utility districts and transit districts, CALTRANS, the Metropolitan Transportation Commission, various public works departments, and the U.S. Department of Transportation. Also involved in physical reconstruction issues will be the U.S. Department of Housing and Urban Development, the Department of Energy, the U.S. Geological Survey, the State Department of Conservation, the Department of Industrial Relations, the Public Utility Commission, and local redevelopment agencies.

With as broad involvement as is indicated above, strong leadership is necessary to ensure that physical reconstruction conforms to goals and priorities worked out by the many stakeholders. In practice, it is likely that rather careful scheduling of construction activities, managed by experienced contractors, will be required.

Entities Related to Functions

The transition from emergency response to reconstruction activities will be difficult not only because of the demands of the former on the resources of agencies that will be engaged in both sets of activities but also because of the more complex interactions over relatively long periods of time that will be required. Table C-3 summarizes the entity/functional relationships that might characterize the reconstruction period and provides rough estimates--for one county--of the numbers of different entities that might be involved. These numbers are approximate since reliance was placed on published sources and limited personal contacts.

The table lists functions ranging from those performed primarily by government to those performed by both public and private sectors to those performed largely by the private sector. As has been indicated earlier in this appendix, large numbers of entities could potentially be involved in each of the functions, even in the one county used as an example. The very large numbers (500 or more entities) reflect the fragmented character of some of the private sector activities. For example, there are about 1,800 offices of physicians and other health practitioners, 1,600 contract construction establishments, and more than 1,000 establishments involved in the manufacture and distribution of food products. Many of these are small firms, particularly in the retail trade sector, and may not be operable after the earthquake; others are branches of larger firms, and with some coordination effort could be reopened sequentially to optimize the use of resources.

Although fewer government entities are involved, some functions may be performed by as many as 40-50 agencies. As discussed above, some local government functions are provided by the county, most cities and a variety of special districts. Fire protection in Alameda County, for example is provided by a regional entity and by the county, 13 cities, and 12 special districts. Although a listing can be made of these districts there is no centralized information on district boundaries or manpower and equipment resources. This problem characterizes a number of the other fragmented functions, making coordination difficult to accomplish after a disaster.

Table C-3

ENTITIES RELATED TO RECONSTRUCTION FUNCTIONS, ALAMEDA COUNTY

	FIRE PROTECTION	LAW ENFORCEMENT	UTILITIES	COMMUNICATIONS	HEALTH AND MEDICAL	TRANSPORTATION	CONSTRUCTION	FINANCIAL SERVICES	MANPOWER SERVICES	PROVISION OF FOOD	PROVISION OF GASOLINE	PROVISION OF BUILDING MATERIALS
PUBLIC SECTOR												
FEDERAL	X	X		X	X		X	X	X	*	*	
STATE	X	X	X	X	X		X	X	X	*	*	
REGIONAL	X		X		X	X	*					
COUNTY	X	X	X	X	X		X		X	*	*	
MUNICIPALITY	X	X	X	X	X		X		X	*	*	
SPECIAL DISTRICT	X		X	X	X							
QUASI PUBLIC SECTOR												
VOLUNTARY ORGANIZATIONS					X					X		
OTHER NONPROFIT										X		
PRIVATE SECTOR												
CONSTRUCTION							X					
MANUFACTURING	*	*			*		*			X	X	X
TRANSPORTATION	*	*			*	X						
COMMUNICATION				X								
UTILITIES	*	*	X		*		*					
WHOLESALE TRADE		*								X	X	X
RETAIL TRADE										X	X	X
FINANCE AND RELATED SERVICES		*			X			X	X			
APPROXIMATE NUMBER OF ENTITIES	40	20	45	100	2000	600	1600	550	100	1100	600	100

*Some entities maintain functional capability for internal use only.

Table C-3 constitutes a superficial analysis of the entity/function relationships. To ensure rapid and efficient mobilization of resources after a major disaster, a more detailed compilation would be required. This would include information for each entity category on location, manpower and equipment resources, legal/institutional constraints, and other factors. In the case of private-sector establishments, resources maintained for internal use that might contribute to the reconstruction effort should also be identified and procedures for their integration into the larger effort specified. Such information, if updated on a regular basis, would facilitate the organizational activities required during the stressful period of immediate response as well as during reconstruction.

Appendix D

DISCUSSION DRAFT STATE/FEDERAL RECONSTRUCTION GUIDELINES

Appendix D

DISCUSSION DRAFT STATE/FEDERAL
RECONSTRUCTION GUIDELINES

PART I - INTRODUCTION

A. Purpose

The purpose of these guidelines, which are incorporated as an annex to the California Earthquake Response Plan and to the Federal Plan for Earthquake Response and Assistance (San Francisco Bay Area), is to facilitate recovery and reconstruction by establishing goals and priorities and defining operational concepts to ensure optimal use of government (federal, state, and local) and private sector resources.

B. Objectives

The objectives of the procedures described below are to:

(1) Ensure the restoration of essential services to the affected communities on an equitable basis.

(2) Provide a priority-based procedure for implementing a reconstruction program.

(3) Integrate emergency response/recovery operations into the longer-term reconstruction phase.

C. Relationship to Other Plans

(1) State of California Earthquake Response Plan
This plan is keyed primarily to the emergency period but has as one objective the provision of a basis for subsequent recovery. Concepts of local, intermediate-level, state government, federal government, and military operations are defined, uses of special facilities outlined, and special tasks specified. However, no specific reconstruction functions are covered.

(2) State of California Emergency Plan
Section 3 to Part Two (Peacetime Plan) of the State Emergency Plan covers actions to be taken by appropriate government agencies and private relief organizations "to alleviate damage, loss, hardship or suffering and to expedite the recovery/rehabilitation efforts in both public and private sectors." However, the concentration is on the sequence of actions leading to the state and federal Declarations of Emergency and Major Disaster and on the establishment of assistance mechanisms (Disaster Field Offices and Disaster Assistance Centers).

(3) Other Emergency Plans
Both federal and local government earthquake response or emergency operations plans concentrate on the emergency response actions to provide immediate assistance to those in need and to facilitate the restoration of essential services.

D. Situation

The operations covered by the plans outlined above have been implemented. The immediate needs of the population are being met; major transportation links are being opened; buildings are being inspected and, if required, marked for demolition; and essential services are being restored on at least a temporary basis. Reconstruction will require years, massive expenditures, a significant commitment of construction resources, and large amounts of outside assistance. Unless goals and priorities are set and implementation mechanisms are established, reconstruction will be on a laissez-faire basis subject to availability of financial resources, varying distributional rules of different agencies, and economic or political power of individuals, organizations, or other entities.

PART II - RECONSTRUCTION GOALS AND PRIORITIES

A. Reconstruction Goals

The long-term goal is to restore and rebuild in a way that makes the affected area less vulnerable, economically as sound, and more attractive than it was prior to the earthquake. The extensive damage caused by the

earthquake and the resulting knowledge regarding seismic activity and structural vulnerability make this goal a possibility, using building code requirements and land use designations as implementing mechanisms.

The specification of this goal, however, must reflect another goal for which there is significant support: restoration of public buildings, infrastructure, and private housing and industry as rapidly as possible. The least complex goal specification would be a return to the former status quo with no change in building codes, land use, government entity boundaries or areas of fill. But this approach would retain the vulnerabilities that contributed to the current damage.

The goal adopted, therefore, is to reduce vulnerability to future earthquake damage by encouraging the following:

- Mandatory open space in areas subject to Intensity X from an 8.0 magnitude earthquake on either the San Andreas or the Hayward Fault; this is an extension of the provisions of the Alquist-Prido Special Study Zones Act of 1972.
- Mandatory open space in liquefaction areas except for areas constituting major highway links or port areas or otherwise designated as exceptions by the California Seismic Safety Commission.
- Building code provisions requiring earthquake-resistant features to be incorporated in all reconstructed or new buildings in areas subject to Intensity VIII or more (as delineated by the Seismic Safety Commission) from an earthquake of magnitude 8.0 on either the San Andreas or the Hayward Fault. This is an extension of the provisions of existing legislation covering schools and hospitals and of the urban planning legislation requiring seismic safety elements in local general plans.

The administrative mechanisms for attaining this goal are described in Part III.

B. Reconstruction Priorities

Activities initiated during the first week reflect the initial response/recovery priorities. Roads are being cleared, debris is being moved, essential services are being restored. These activities constitute needed responses but, if used as the basis for setting long-term reconstruction priorities, would support a return to the former status quo. Furthermore, priorities for allocation of construction and financial resources among communities or among functions have not been established, and it is likely that some arrangements for reconstruction have already been made by individuals, companies, or local governments.

The following priorities are hereby established:

(1) Demolition of hazardous buildings. Local authorities are responsible for authorizing demolition; local and outside resources will be allocated to this function on a priority basis.

(2) Provision of minimal utility and urban infrastructure services to each community. Construction of permanent facilities will not be initiated until formal land use plans have been adopted.

(3) Identification of set-aside land in accordance with reconstruction goals. Affected local governments must agree with goals or participate in a regional authority with responsibility for land use determination.

(4) Development of regional reconstruction plan. This requires federal/state/local government and private-sector involvement to obtain agreement on resource allocation. Scheduling of resources should reflect the following sequence:

- Removal of debris.
- Establishment of procedures for acquisition of set-aside land.
- Repair of damaged housing.
- Repair of industrial/commercial structures.
- Repair/construction of sanitation facilities.
- Provision of bank services, through temporary facilities if necessary.

- Repair of major transportation routes and bridge approaches.
- Repair/construction of government buildings, schools, and hospitals.
- Construction of new residential and nonresidential buildings.

For a reconstruction effort of this magnitude, careful scheduling of available publicand private-sector resources from inside and outside the area will be required. Procedures for obtaining the agreement/cooperation of the many entities that will be participating must be set up and financial arrangements need to be made. An organizational structure to address these issues is described in Part III.

PART III - OPERATIONAL CONCEPTS

A. General Concept of Operations

The following administrative mechanism has been established and is operating. A Federal Coordinating Officer (FCO) a and State Coordinating Officer (SCO) and staffs have collocated in the federally established Disaster Field Office (DFO). Satellite Field Offices (SFO) have been established as required. This administrative structure is heavily involved in response and immediate recovery activities and needs to be supplemented by a mechanism to plan and implement the reconstruction effort. The latter needs to be able both to facilitate the major federal response that will be required and to work with local governments and private-sector organizations to ensure an effective reconstruction effort in conformance with established goals and priorities. The organizational structure is shown in Figure 1. The major concentration of the State/Federal Coordinating Office (SFCO) will initially be on establishing the DFO and SFOs and on ensuring that they are functioning efficiently in providing immediate response functions. Within the first week, however, a State/Federal Reconstruction Commission should be organized and work initiated on evaluating needs, identifying available resources, and specifying required legislative actions at the state and federal levels.

The primary concentration of the SCO and the FCO from this point on will be the reconstruction effort.

B. Disaster and Satellite Field Offices

The organization for state and federal participation in the immediate response/recovery operations is described in the State of California Earthquake Response Plan and the Federal Plan for Earthquake Response and Assistance (San Francisco Bay Area). The activities of state and federal agencies will be closely coordinated, with oversight from the State/Federal Coordinating Office. The emergency response tasks will be continued until the specific problems are alleviated. The Resources and Support Task as defined in the state plan will form a nucleus for reconstruction efforts; the initial concentration of resources will be on clearing/constructing a minimum transportation network, on providing essential services to each community, and on demolition of buildings found to be unsafe (after consultation with appropriate local officials and owners). Longer-term allocation of resources will be made according to priorities set by the State/Federal Reconstruction Commission.

The SFOs and the DFO will provide a mechanism for maintaining a current assessment of damage, of progress in restoring essential service, and of requests for major commitments of resources. This information will be used by the Reconstruction Commission to plan the specifics of the reconstruction effort, including the assistance to be provided by state and federal governments.

C. State/Federal Reconstruction Commission

The function of the Reconstruction Commission is to lead the reconstruction effort and to ensure the availability of appropriate state and federal assistance. The commission will be co-chaired by the SCO and the FCO; the major state and federal agency heads will constitute the membership. It is

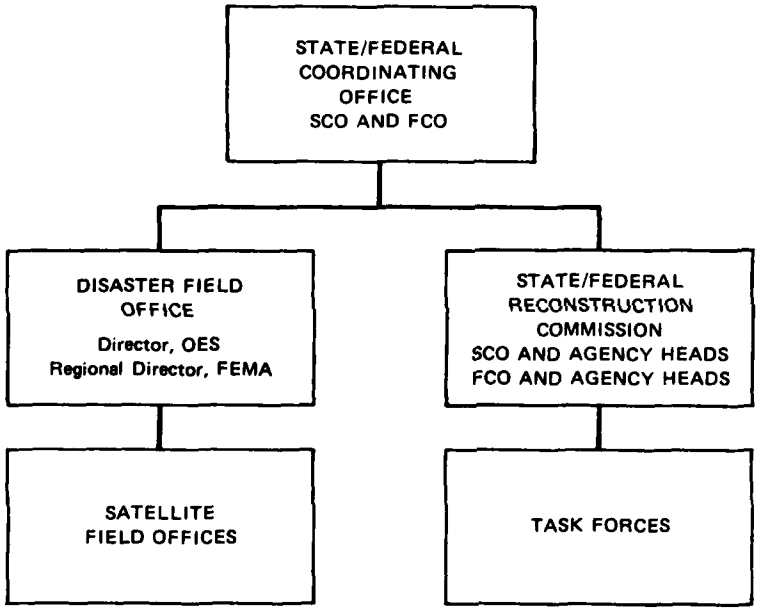

FIGURE 1 ORGANIZATION FOR RECOVERY AND RECONSTRUCTION FOLLOWING A MAJOR NATURAL DISASTER

essential that both the SCO and the FCO be leaders with influence at the state and federal levels; senior members of the state legislature and Congress would complement the Executive Branch membership and facilitate the passage of new legislation, if required.

Task forces will be established to assume responsibility for critical functions:

(1) Infrastructure
(2) Transportation
(3) Financial institutions
(4) Housing
(5) Industrial development
(6) Vulnerability analysis
(7) Interjurisdictional relations
(8) Private sector involvement.

The first five task forces will be concerned with assessing damage and restoration information, conducting a resource requirements analysis, recommending the type and magnitude of government assistance (including legislative or regulatory changes), and suggesting a tentative timetable in accordance with established goals and priorities.

The Vulnerability Analysis Task Force, working closely with the staff of the California Seismic Safety Commission and the U.S. Geological Survey, will examine all available seismic data and damage information and recommend changes in building code and land use goals, if required. Draft legislation or amendments to existing legislation will also be prepared to provide a statutory base for seismic safety provisions. The Interjurisdictional Relations Task Force will be responsible for maintaining liaison with local jurisdictions to encourage the adoption of recommended building code and land use provisions, to assist in the implementation of priorities and to facilitate the application for and provision of outside assistance. The

Private-Sector Involvement Task Force is responsible for coordinating the allocation of private sector resources to conform to reconstruction timetables adopted by the State/Federal Reconstruction Commission.

Appendix E

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Appendix E

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Plate 1 Maximum Earthquake Intensity for the San Francisco Bay Area, February 1978.

Plate 2a Sample Cumulative Economic Risk Map for Earthquake Damage, Small Wood-Frame Buildings, February 1978 (100-year recurrence level, all faults).

Plate 2b Sample Cumulative Economic Risk Map for Earthquake Damage, Other Small Buildings, February 1978 (100-year recurrence interval, all faults).

Plate 3a Sample Cumulative Economic Risk Map for Earthquake Damage, Small Wood-Frame Buildings, February 1978 (100-year recurrence interval, 6 faults, 1000-year interval, 5 faults).

Plate 3b Sample Cumulative Economic Risk Map for Earthquake Damage, Other Small Buildings (100-year recurrence interval, 6 faults, 1000-year interval, 5 faults).

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