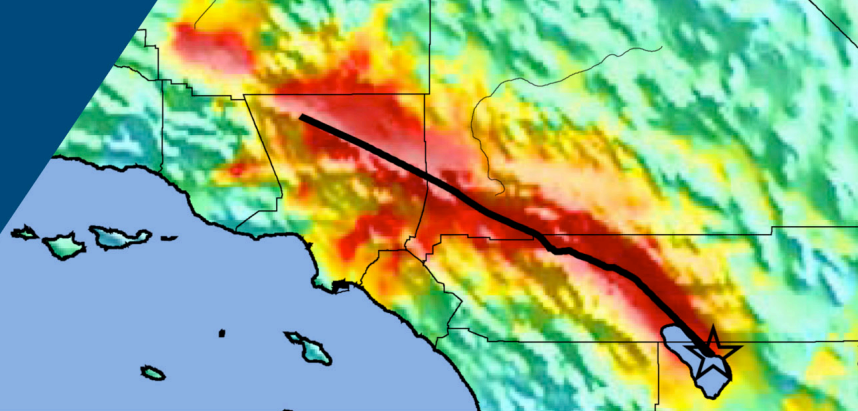


The ShakeOut Scenario

Supplemental Study



HAZUS

Prepared for
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Pasadena CA

and

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Sacramento CA

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The ShakeOut Scenario:

U.S. Geological Survey Open File Report 2008-1150
California Geological Survey Preliminary Report 25 version 1.0

U.S. Geological Survey Circular 1324
California Geological Survey Special Report 207 version 1.0



Note: over the course of the ShakeOut Scenario, the project name evolved. Where a study mentions *the SoSAFE Scenario* or *San Andreas Fault Scenario*, it refers to what is now named the ShakeOut Scenario.

HAZUS® Enhancements and Implementation for the ShakeOut Scenario Earthquake

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HAZUS®^{MH}

HAZUS® (HAZards U.S.), developed for the Federal Emergency Management Agency (FEMA) by the National Institute of Building Sciences (NIBS), is geographic information system (GIS) based, standardized, nationally applicable multi-hazard loss estimation methodology and software. Local, state and federal government officials use HAZUS®^{MH} for preparedness, emergency response, and mitigation planning. Initially released in 1997 as an earthquake loss estimation tool, the current version of HAZUS - HAZUS®^{MH} - also includes flood and hurricane wind modeling capabilities. The version of HAZUS® utilized for the ShakeOut scenario is referred to as Maintenance Release 3 (MR-3), released in September of 2007.

Because HAZUS®^{MH} was intended to facilitate natural hazard risk assessments on a consistent basis nationwide, the software is provided with a significant amount of default data to allow the user to run a simplified (HAZUS® Level 1) analysis “straight from the box”, without input of any additional data. By virtue of the fact that the default databases must be assembled at a national level, the data may be, in some cases, incomplete (having been collected by other agencies for different purposes) or out of date (some data are no longer available in the public domain due to security and other concerns). While Level 1 analyses are useful for gauging the approximate magnitude of potential impacts, the accuracy of results can be enhanced by the input of “user-supplied” data, resulting in a HAZUS® Level 2, and potentially Level 3 analysis. **The HAZUS® enhancements conducted for the ShakeOut scenario, including generation of custom ground motion and other secondary hazard inputs, incorporation of significant building inventory database enhancements, and economic and population parameter adjustment (tested using a calibration exercise for the 1994 Northridge earthquake), result in a HAZUS® earthquake loss assessment that would be considered “Level 3”.**

HAZUS® Enhancements for the ShakeOut Scenario

Custom Ground Motion and Hazards Data

As noted above, custom ground motion and secondary hazard data were developed by the USGS and CGS for incorporation into HAZUS®^{MH}, including census tract-based “exposure-weighted” ground motion, liquefaction and landslide data. The development of these data is discussed elsewhere (Ponti).

Building Inventory Data Enhancements in HAZUS®^{MH}

Default building inventory data in HAZUS®^{MH} consists of aggregated proxy data representing the “general building stock”, as well as site-specific facility information for selected lifeline and essential facilities. Aggregate regional building inventory databases, representing building square footage by HAZUS®^{MH} occupancy class, have been developed from census data for residential occupancies, and from Dun & Bradstreet employment data for non-residential occupancies. Recent enhancements for HAZUS®^{MH} MR-3 include an update of non-residential building square footages, as well as updates to

the dollar exposure data (building value and contents value) to reflect both the updated non-residential square footages and to update the basis of the replacement cost model to 2006.

For the ShakeOut scenario, the default building inventory database tables (square footage and building count) for Los Angeles County were replaced with a database derived from 2005 Assessor's data. This database was previously developed to pilot test a database enhancement methodology specifically for HAZUS^{®MH} (ABS Consulting and ImageCat Inc., 2006). In addition, for use in the ShakeOut scenario, exposure values (both building and content) for the Los Angeles data were updated for consistency with the latest HAZUS^{®MH} building and content valuation models. Comparison of the updated inventory data to the HAZUS^{®MH} default demonstrates the importance of this type of update; for commercial and industrial occupancies, the HAZUS^{®MH} default data has 40% less building square footage than the database derived from Assessor's data.

Mapping Scheme Improvements

Building inventory data in HAZUS^{®MH} is stored in two types of tables: occupancy exposure tables (aggregate data on square footage, building count, building exposure value and content exposure value stored by occupancy at the census tract level) discussed above, and mapping scheme tables, (distributions indicating typical construction types by occupancy).

Within HAZUS^{®MH}, occupancy mapping tables indicate, by occupancy, the percent distribution of square footage among various structural or model building types (see Table 1 for a complete list of model building types available within HAZUS^{®MH} MR-3). Occupancy mapping relationships within HAZUS^{®MH} exist at two levels: 1) a general mapping scheme, which indicates the single, assumed regional distribution of square footage by occupancy across the five basic construction classes or basic building types (Wood, Concrete, Steel, Masonry, and Manufactured Housing), and 2) specific occupancy mapping schemes or building type distributions, which indicate, for a given occupancy and material type, the distribution across the detailed model building types, including variations reflecting the various design levels and building quality classes (e.g., "High-Code" = High-seismic design, Code quality).

These detailed mapping scheme distributions drive which vulnerability functions will be used to estimate damage and loss for each occupancy class. Default mapping schemes are provided with the HAZUS^{®MH} software. California's default mapping schemes are designated "CA1", "CA2", and "CA3". "CA3" is applied in high seismic hazards zones (89% of census tracts in California), "CA2" is used for moderate seismic hazards zones (8%), and "CA1" is used for low seismic hazard zones (3%). Within the ShakeOut eight county study region, the default mapping scheme assignment is exclusively "CA3".

Because a HAZUS^{®MH} study region can make use of more than one mapping scheme at a time, for the ShakeOut scenario, the single default mapping scheme was replaced with 24 different mapping schemes, reflecting variation in construction over time, urban core construction concentrations, and URM mitigation. The various mapping scheme improvements are as follows:

1. The default singular general mapping scheme was replaced with one developed from Los Angeles County Assessor's data. While construction patterns are expected to vary somewhat from county to county, a replacement scheme based on local data is expected to be better than the default, and Los Angeles County represents about half of the total square footage exposure in the eight counties.
2. Default mapping schemes in HAZUS^{®MH} represent exclusively low-rise construction. Improved mapping schemes were developed to better reflect the potential for mid-rise and high-rise structures, with the assistance of structural engineering experts with decades of

experience in design and construction in southern California (M. Mehrain of URS and M. Johnson of ABS Consulting). Replacement mapping schemes included both “urban core” areas (areas where high-rise buildings would be expected) and “non-urban core” areas (where construction was expected to consist solely of low- and mid-rise buildings).

3. Replacement occupancy mapping schemes were also developed to reflect changes in construction patterns over time. Mapping schemes were developed to reflect three different vintage mixes, with census tract assignments to particular schemes based on available census data on median year of residential construction.
4. Data on unreinforced masonry structures and their mitigation status, available from the California Seismic Safety Commission (2006), were used to iteratively calibrate the masonry mapping schemes to ensure a reasonable representation of URM for each county. Particular attention was paid to ensure that the total amount of URM in each County matched reported survey data reasonably well, and that the percentage mitigated was reflected in the assigned design and quality level.

Economic Parameter Adjustment

To assess the need for economic parameter adjustment, a loss calibration exercise using the 1994 Northridge earthquake was conducted. A “best-estimate” HAZUS®^{MH} assessment was performed, using the final USGS ShakeMap for the Northridge earthquake, the latest version of HAZUS®^{MH}, and building inventory enhancements described above.

A comparison between HAZUS’ direct economic loss total, and a current estimate of building-related losses in the Northridge earthquake (Eguchi et al., 1998; Seligson & Eguchi; 2005) indicated that the use of two adjustments resulted in building-related loss estimates within 4% of the estimated event totals. These adjustments were:

- 1) Reduction of the HAZUS®^{MH} default “recapture” factors to zero (recommended by Adam Rose). Justification for this reduction includes the fact that the original default values are considered very crude, and represent a maximum level of resilience.
- 2) Increase in building exposure values to better reflect the true replacement value of structures in the eight county region. This increase is similar to an increase applied in the recent 1906 Earthquake Scenario for the San Francisco Bay Area using HAZUS®^{MH} (Kircher et al., 2006), although decreased proportionately to reflect the variation in construction costs within California.

It should be noted that the calibration exercise did not include secondary hazard data as input to HAZUS®^{MH}, but these losses were included in the total economic loss being evaluated for calibration. Accordingly, the loss modeling approach suggested implicitly includes some secondary hazard loss, although the magnitude of loss due to secondary hazards in the Northridge earthquake is expected to be much smaller than that in the current ShakeOut scenario.

Shelter Parameter Adjustment

In addition to the economic parameter adjustments, adjustments to the default shelter parameters were also recommended by Prof. Kim Shoaf, based on available survey data from the Northridge and other California earthquakes. For example, parameters indicating the percentage of households seeking shelter based on building damage state were adjusted to include some shelter-seeking for occupants of moderately damaged residential structures (normally set to zero in the HAZUS®^{MH} default).

Table 1. HAZUS^{®MH} Model Building Types (after DHS/FEMA, 2007)

HAZUS^{®MH} Model Building Type	Description
W1	Wood, light frame ($\leq 5,000$ square feet)
W2	Wood, commercial and industrial ($>5,000$ square feet)
S1L, S1M, S1H	Steel moment frame, low-, mid- and high-rise
S2L, S2M, S2H	Steel braced frame, low-, mid- and high-rise
S3	Steel light frame
S4L, S4M, S4H	Steel frame with cast-in-place concrete shear walls, low-, mid- and high-rise
S5L, S5M, S5H	Steel frame with unreinforced masonry infill walls, low-, mid- and high-rise
C1L, C1M, C1H	Concrete moment frame, low-, mid- and high-rise
C2L, C2M, C2H	Concrete shear walls, low-, mid- and high-rise
C3L, C3M, C3H	Concrete frame with unreinforced masonry infill walls, low-, mid- and high-rise
PC1	Pre-cast concrete tilt-up walls
PC2L, PC2M, PC2H	Pre-cast concrete frames with concrete shear walls, low-, mid- and high-rise
RM1L, RM1M	Reinforced masonry bearing walls with wood or metal deck diaphragms, low- and mid-rise
RM2L, RM2M, RM2H	Reinforced masonry bearing walls with pre-cast concrete diaphragms, low-, mid- and high-rise
URML, URMM	Unreinforced masonry bearing walls, low- and mid-rise
MH	Mobile homes

References:

ABS Consulting and ImageCat, Inc. (2006), Data Standardization Guidelines for Loss Estimation – Populating Inventory Databases for HAZUS^{®MH} MR-1, prepared for the California Governor’s Office of Emergency Services

California Seismic Safety Commission (2006), “Status of the Unreinforced Masonry Building Law: 2006 Progress Report to the Legislature”, Seismic Safety Commission Report Number SSC 2006-04.

Eguchi, R.T., J.D. Goltz, C.E. Taylor, S.E. Chang, P.J. Flores, L.A. Johnson, H.A. Seligson and N.C. Blais (1998), “Direct Economic Losses in the Northridge Earthquake: A Three-Year Post-Event Perspective”, *Earthquake Spectra*, Volume 14, No. 2, May.

Kircher, C.A., H.A. Seligson, J. Bouabid and G.C. Morrow (2006), “When the Big One Strikes Again – Estimated Losses due to a Repeat of the 1906 San Francisco Earthquake”, *Earthquake Spectra*, Vol. 22, Special Issue II, April.

Seligson, H.A., and R.T. Eguchi (2005), “The True Cost of Earthquake Disasters: An Updated Tabulation of Losses for the 1994 Northridge Earthquake”, Proceedings of the International Symposium on Earthquake Engineering, Awaji, Japan, January 13 – 16, 2005

HAZUS-MH: Earthquake Event Report

Region Name ShakeOut 8 County Study Region Feb 6 2008

Earthquake Scenario: ShakeOut V2 San Andreas M7.8

Print Date: February 07, 2008

Totals only reflect data for those census tracts/blocks included in the user's study region.

Disclaimer:

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 8 county(ies) from the following state(s):

California

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 51,025.74 square miles and contains 4,147 census tracts. There are over 6,589 thousand households in the region and has a total population of 19,991,484 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 4,865 thousand buildings in the region with a total building replacement value (excluding contents) of 1,966,107 (millions of dollars). Approximately 95.00 % of the buildings (and 0.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 87,634 and 23,477 (millions of dollars) , respectively.

Building Inventory

HAZUS estimates that there are 4,865 thousand buildings in the region which have an aggregate total replacement value of 1,966,107 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 92% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 243 hospitals in the region with a total bed capacity of 51,856 beds. There are 6,435 schools, 1,100 fire stations, 444 police stations and 22 emergency operation facilities. With respect to HPL facilities, there are 333 dams identified within the region. Of these, 200 of the dams are classified as 'high hazard'. The inventory also includes 2,916 hazardous material sites, 0 military installations and 1 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 2 and 3.

The total value of the lifeline inventory is over 111,111.00 (millions of dollars). This inventory includes over 11,762 kilometers of highways, 8,799 bridges, 417,863 kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	8,799	23,790.20
	Segments	1,232	48,398.80
	Tunnels	20	36.30
	Subtotal		72,225.30
Railways	Bridges	249	46.80
	Facilities	141	362.70
	Segments	2,368	4,341.00
	Tunnels	0	0.00
	Subtotal		4,750.40
Light Rail	Bridges	51	13.30
	Facilities	0	0.00
	Segments	14	209.20
	Tunnels	0	0.00
	Subtotal		222.50
Bus	Facilities	107	137.60
	Subtotal		137.60
Ferry	Facilities	0	0.00
	Subtotal		0.00
Port	Facilities	235	604.50
	Subtotal		604.50
Airport	Facilities	190	1,221.90
	Runways	231	8,471.80
	Subtotal		9,693.70
		Total	87,634.00

Table 3: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4,178.60
	Facilities	51	2,004.00
	Pipelines	0	0.00
	Subtotal		6,182.60
Waste Water	Distribution Lines	NA	2,507.20
	Facilities	94	7,387.30
	Pipelines	0	0.00
	Subtotal		9,894.50
Natural Gas	Distribution Lines	NA	1,671.50
	Facilities	14	18.00
	Pipelines	0	0.00
	Subtotal		1,689.50
Oil Systems	Facilities	63	7.40
	Pipelines	0	0.00
	Subtotal		7.40
Electrical Power	Facilities	108	14,018.40
	Subtotal		14,018.40
Communication	Facilities	359	42.40
	Subtotal		42.40
	Total		31,834.70

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	ShakeOut V2 San Andreas M7.8
Type of Earthquake	User-defined
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	7.80
Depth (Km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Building Damage

HAZUS estimates that about 305,401 buildings will be at least moderately damaged. This is over 6.00 % of the total number of buildings in the region. There are an estimated 45,138 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summarizes the expected damage by general occupancy for the buildings in the region. Table 5 summarizes the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2,860	0.07	341	0.06	163	0.08	39	0.07	13	0.03
Commercial	136,030	3.44	21,299	3.54	11,249	5.46	2,629	4.86	799	1.77
Education	4,537	0.11	517	0.09	266	0.13	79	0.15	22	0.05
Government	2,138	0.05	275	0.05	206	0.10	71	0.13	30	0.07
Industrial	37,948	0.96	5,275	0.88	3,314	1.61	1,258	2.33	521	1.15
Other Residential	553,848	13.99	78,793	13.08	54,579	26.47	33,749	62.41	40,444	89.60
Religion	10,828	0.27	1,463	0.24	605	0.29	142	0.26	44	0.10
Single Family	3,209,557	81.10	494,398	82.08	135,803	65.86	16,112	29.79	3,267	7.24
Total	3,957,745		602,361		206,184		54,079		45,139	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	3,723,116	94.07	555,351	92.20	151,354	73.41	19,642	36.32	4,412	9.77
Steel	12,831	0.32	3,500	0.58	2,608	1.26	592	1.09	123	0.27
Concrete	40,522	1.02	8,521	1.41	5,773	2.80	1,518	2.81	493	1.09
Precast	12,615	0.32	1,904	0.32	795	0.39	104	0.19	14	0.03
RM	59,819	1.51	5,929	0.98	3,291	1.60	876	1.62	190	0.42
URM	10,843	0.27	1,569	0.26	646	0.31	270	0.50	258	0.57
MH	97,999	2.48	25,587	4.25	41,718	20.23	31,077	57.47	39,649	87.84
Total	3,957,745		602,361		206,184		54,079		45,139	

*Note:

RM Reinforced Masonry
 URM Unreinforced Masonry
 MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 51,856 hospital beds available for use. On the day of the earthquake, the model estimates that only 48,601 hospital beds (94.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 100.00% of the beds will be back in service. By 30 days, 100.00% will be operational.

Table 6: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	243	0	0	232
Schools	6,435	32	0	5,930
EOCs	22	1	0	16
PoliceStations	444	16	0	386
FireStations	1,100	47	0	943

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	1,232	0	0	0	0
	Bridges	8,799	0	0	0	0
	Tunnels	20	0	0	0	0
Railways	Segments	2,368	0	0	0	0
	Bridges	249	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	141	0	0	0	0
Light Rail	Segments	14	0	0	0	0
	Bridges	51	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	107	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	235	0	0	0	0
Airport	Facilities	190	0	0	0	0
	Runways	231	0	0	0	0

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	51	0	0	0	0
Waste Water	94	0	0	0	0
Natural Gas	14	0	0	0	0
Oil Systems	63	0	0	0	0
Electrical Power	108	0	0	0	0
Communication	359	0	0	0	0

Table 9 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	208,932	0	0
Waste Water	125,359	0	0
Natural Gas	83,573	0	0
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	6,589,820	0	0	0	0	0
Electric Power		0	0	0	0	0

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 10.00 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 44.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 400,000 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 31,182 households to be displaced due to the earthquake. Of these, 30,126 people (out of a total population of 19,991,484) will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	83	19	3	5
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	94	20	3	5
	Industrial	176	38	3	6
	Other-Residential	8,086	1,745	121	209
	Single Family	2,864	331	11	17
	Total	11,303	2,154	140	242
2 PM	Commercial	5,591	1,288	181	353
	Commuting	0	0	0	0
	Educational	1,304	283	36	70
	Hotels	18	4	1	1
	Industrial	1,277	277	24	43
	Other-Residential	1,880	411	30	50
	Single Family	631	77	3	4
	Total	10,702	2,341	275	521
5 PM	Commercial	4,589	1,072	154	292
	Commuting	0	0	0	0
	Educational	139	29	4	7
	Hotels	28	6	1	2
	Industrial	798	173	15	27
	Other-Residential	2,966	640	47	78
	Single Family	1,097	130	5	7
	Total	9,618	2,050	225	412

Economic Loss

The total economic loss estimated for the earthquake is 56,393.97 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 56,393.97 (millions of dollars); 23 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 41 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	488.80	3,311.57	2,433.10	114.40	6,347.86
	Capital-Related	0.00	206.71	3,447.68	1,436.14	28.73	5,119.26
	Rental	217.66	620.89	664.23	22.92	19.25	1,544.95
	Relocation	24.41	21.99	41.28	2.70	5.77	96.15
	Subtotal	242.07	1,338.38	7,464.76	3,894.86	168.15	13,108.22
Capital Stock Losses							
	Structural	1,504.09	1,431.25	2,738.18	781.29	274.53	6,729.33
	Non_Structural	7,809.13	6,698.90	7,348.86	2,998.43	1,141.73	25,997.04
	Content	2,623.85	1,410.88	3,788.16	1,897.89	570.70	10,291.48
	Inventory	0.00	0.00	87.74	176.86	3.31	267.91
	Subtotal	11,937.06	9,541.03	13,962.94	5,854.46	1,990.26	43,285.75
Total		12,179.13	10,879.41	21,427.71	9,749.31	2,158.41	56,393.97

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	48,398.78	\$0.00	0.00
	Bridges	23,790.17	\$0.00	0.00
	Tunnels	36.31	\$0.00	0.00
	Subtotal	72225.30	0.00	
Railways	Segments	4,340.96	\$0.00	0.00
	Bridges	46.76	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	362.71	\$0.00	0.00
	Subtotal	4750.40	0.00	
Light Rail	Segments	209.22	\$0.00	0.00
	Bridges	13.28	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	222.50	0.00	
Bus	Facilities	137.62	\$0.00	0.00
	Subtotal	137.60	0.00	
Ferry	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	0.00	
Port	Facilities	604.51	\$0.00	0.00
	Subtotal	604.50	0.00	
Airport	Facilities	1,221.89	\$0.00	0.00
	Runways	8,471.79	\$0.00	0.00
	Subtotal	9693.70	0.00	
	Total	87634.00	0.00	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	\$0.00	0.00
	Facilities	2,004.00	\$0.00	0.00
	Distribution Lines	4,178.60	\$0.00	0.00
	Subtotal	6,182.63	\$0.00	
Waste Water	Pipelines	0.00	\$0.00	0.00
	Facilities	7,387.30	\$0.00	0.00
	Distribution Lines	2,507.20	\$0.00	0.00
	Subtotal	9,894.45	\$0.00	
Natural Gas	Pipelines	0.00	\$0.00	0.00
	Facilities	18.00	\$0.00	0.00
	Distribution Lines	1,671.50	\$0.00	0.00
	Subtotal	1,689.46	\$0.00	
Oil Systems	Pipelines	0.00	\$0.00	0.00
	Facilities	7.40	\$0.00	0.00
	Subtotal	7.43	\$0.00	
Electrical Power	Facilities	14,018.40	\$0.00	0.00
	Subtotal	14,018.40	\$0.00	
Communication	Facilities	42.40	\$0.00	0.00
	Subtotal	42.36	\$0.00	
	Total	31,834.74	\$0.00	

Table 15. Indirect Economic Impact with outside aid

(Employment as # of people and Income in millions of \$)

LOSS	Total	%

Appendix A: County Listing for the Region

Imperial,CA

Kern,CA

Los Angeles,CA

Orange,CA

Riverside,CA

San Bernardino,CA

San Diego,CA

Ventura,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California	Imperial	142,361	5,435	2,935	8,370
	Kern	661,645	35,172	16,379	51,551
	Los Angeles	9,519,338	520,710	442,626	963,337
	Orange	2,846,289	197,780	109,020	306,800
	Riverside	1,545,387	95,622	40,278	135,901
	San Bernardino	1,709,434	99,681	42,546	142,228
	San Diego	2,813,833	193,453	86,141	279,595
	Ventura	753,197	54,050	24,271	78,322
Total State		19,991,484	1,201,903	764,196	1,966,104
Total Region		19,991,484	1,201,903	764,196	1,966,104

Building Stock Exposure By General Occupancy

February 06, 2008

All values are in thousands of dollars

	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
California								
Imperial	5,435,339	1,943,335	273,292	166,964	185,713	114,345	251,543	8,370,531
Kern	35,172,237	10,558,284	2,292,375	754,766	1,315,187	521,703	937,161	51,551,713
Los Angeles	520,710,868	321,855,435	88,407,213	353,778	21,412,597	448,682	10,148,887	963,337,460
Orange	197,780,321	77,870,974	21,276,247	761,339	4,492,931	1,140,923	3,477,949	306,800,684
Riverside	95,622,569	27,371,897	7,527,411	792,540	2,443,575	632,596	1,510,793	135,901,381
San Bernardino	99,681,568	28,265,574	8,470,636	518,183	2,576,015	839,384	1,877,066	142,228,426
San Diego	193,453,749	59,661,700	13,351,268	2,553,473	4,937,351	1,612,394	4,025,243	279,595,178
Ventura	54,050,303	15,135,590	5,228,094	985,220	1,101,056	542,095	1,279,642	78,322,000
Total	1,201,906,954	542,662,789	146,826,536	6,886,263	38,464,425	5,852,122	23,508,284	1,966,107,373
Region Total	1,201,906,954	542,662,789	146,826,536	6,886,263	38,464,425	5,852,122	23,508,284	1,966,107,373

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

Direct Economic Losses For Buildings

February 6, 2008

All values are in thousands of dollars

	Capital Stock Losses					Income Losses				
	Cost Structural Damage	Cost Non-struct. Damage	Cost Contents Damage	Inventory Loss		Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	
California										
San Bernardino	2,360,097	9,260,825	3,267,644	84,475	8.2	36,356	1,670,664	2,149,506	507,560	19,337,127
Riverside	1,329,154	5,174,078	1,804,864	37,845	4.8	19,518	900,199	1,094,694	273,946	10,634,298
Imperial	8,917	26,171	5,896	61	0.4	187	1,155	1,414	1,092	44,893
Ventura	5,301	28,010	14,274	374	0.0	53	3,532	4,251	694	56,490
Orange	410,635	1,443,271	671,243	17,020	0.6	4,842	473,001	486,475	86,866	3,593,352
Los Angeles	2,600,463	10,002,480	4,502,789	127,739	1.3	34,970	2,065,886	2,606,402	672,793	22,613,523
Kern	13,829	56,173	21,684	335	0.1	217	4,599	4,810	1,903	103,552
San Diego	934	6,028	3,081	59	0.0	6	223	306	96	10,733
Total	6,729,331	25,997,037	10,291,476	267,908	2.0	96,149	5,119,259	6,347,859	1,544,949	56,393,969
Region Total	6,729,331	25,997,037	10,291,476	267,908	1.7	96,149	5,119,259	6,347,859	1,544,949	56,393,969

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

School Functionality

February 06, 2008

	Count	Functionality (%)
California		
Imperial	72	98.60
Kern	277	99.30
Los Angeles	3,022	90.60
Orange	809	95.80
Riverside	504	67.90
San Bernardino	603	42.00
San Diego	875	100.00
Ventura	273	99.80
Total	6,435	86.70
Region Total	6,435	86.70

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

Police Station Facilities Functionality

February 06, 2008

	Count	Functionality(%) At Day 1
California		
Imperial	16	90.50
Kern	22	98.80
Los Angeles	166	91.00
Orange	33	95.50
Riverside	53	57.40
San Bernardino	57	42.50
San Diego	73	99.90
Ventura	24	99.70
Total	444	84.40
Region Total	444	84.40

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

Emergency Operation Center Functionality

February 06, 2008

	Count	Functionality(%) At Day 1
California		
Los Angeles	12	83.80
Orange	2	94.20
Riverside	2	33.00
San Bernardino	4	23.00
San Diego	2	100.00
Total	22	66.80
Region Total	22	66.80

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

Hospital Functionality

February 6, 2008

	Total # of Beds	At Day 1		At day 3		At day 7		At day 30		At day 90	
		# of Beds	%	# of Beds	%	# of Beds	%	# of Beds	%	# of Beds	%
California											
Imperial											
Medium Hospital	206	206	99.95	206	99.95	206	99.95	206	99.95	206	99.95
Total	206	206	100.00	206	100.00	206	100.00	206	100.00	206	100.00
Kern											
Large Hospital	1,055	1,055	100.00	1,055	100.00	1,055	100.00	1,055	100.00	1,055	100.00
Medium Hospital	504	504	99.97	504	99.97	504	99.97	504	99.97	504	99.97
Small Hospital	69	69	99.95	69	99.95	69	99.95	69	99.95	69	99.95
Total	1,628	1,628	100.00	1,628	100.00	1,628	100.00	1,628	100.00	1,628	100.00
Los Angeles											
Large Hospital	23,792	23,329	98.05	23,339	98.10	23,759	99.86	23,770	99.91	23,770	99.91
Medium Hospital	4,287	4,060	94.70	4,065	94.81	4,276	99.74	4,283	99.90	4,283	99.90
Small Hospital	179	174	96.98	174	97.03	179	99.85	179	99.92	179	99.92
Total	28,258	27,292	96.60	27,311	96.60	28,207	99.80	28,232	99.90	28,232	99.90
Orange											
Large Hospital	4,646	4,607	99.15	4,607	99.16	4,642	99.91	4,642	99.91	4,642	99.91
Medium Hospital	1,473	1,457	98.88	1,457	98.89	1,471	99.89	1,472	99.90	1,472	99.90
Small Hospital	48	47	97.90	47	98.00	48	99.90	48	99.90	48	99.90
Total	6,167	6,083	98.60	6,086	98.70	6,161	99.90	6,161	99.90	6,161	99.90
Riverside											
Large Hospital	2,083	1,600	76.81	1,610	77.31	2,049	98.37	2,081	99.90	2,081	99.90
Medium Hospital	680	553	81.29	555	81.66	664	97.60	679	99.90	679	99.90
Total	2,763	2,184	79.00	2,196	79.50	2,707	98.00	2,760	99.90	2,760	99.90
San Bernardino											
Large Hospital	3,613	1,474	40.79	1,518	42.02	3,421	94.68	3,609	99.90	3,609	99.90
Medium Hospital	915	730	79.76	734	80.18	906	99.07	914	99.90	914	99.90
Small Hospital	202	167	82.58	168	82.97	200	98.92	202	99.92	202	99.92

	Total # of Beds	At Day 1		At day 3		At day 7		At day 30		At day 90	
		# of Beds	%	# of Beds	%	# of Beds	%	# of Beds	%	# of Beds	%
Total	4,730	3,203	67.70	3,235	68.40	4,614	97.60	4,726	99.90	4,726	99.90
San Diego											
<i>Large Hospital</i>	5,845	5,845	100.00	5,845	100.00	5,845	100.00	5,845	100.00	5,845	100.00
<i>Medium Hospital</i>	705	705	100.00	705	100.00	705	100.00	705	100.00	705	100.00
<i>Small Hospital</i>	24	24	100.00	24	100.00	24	100.00	24	100.00	24	100.00
Total	6,574	6,574	100.00	6,574	100.00	6,574	100.00	6,574	100.00	6,574	100.00
Ventura											
<i>Large Hospital</i>	1,255	1,255	99.98	1,255	99.98	1,255	99.98	1,255	99.98	1,255	99.98
<i>Medium Hospital</i>	197	197	100.00	197	100.00	197	100.00	197	100.00	197	100.00
<i>Small Hospital</i>	78	78	99.95	78	99.95	78	99.95	78	99.95	78	99.95
Total	1,530	1,530	100.00	1,530	100.00	1,530	100.00	1,530	100.00	1,530	100.00
Total	51,856	48,071	92.70	48,150	92.90	51,549	99.40	51,825	99.90	51,825	99.90
Region Total	51,856	48,071	92.70	48,150	92.85	51,549	99.41	51,825	99.94	51,825	99.94

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

Fire Station Facilities Functionality

February 06, 2008

	Count	Functionality(%) At Day 1
California		
Imperial	18	87.20
Kern	60	99.40
Los Angeles	380	89.20
Orange	122	95.80
Riverside	128	64.70
San Bernardino	186	48.00
San Diego	157	99.90
Ventura	49	99.50
Total	1,100	85.50
Region Total	1,100	85.50

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

Debris Summary Report

February 07, 2008

All values are in thousands of tons.

	Brick, Wood & Others	Concrete & Steel	Total
California			
Riverside	1,438	1,310	2,748
San Bernardino	1,903	2,081	3,984
Imperial	23	15	39
Ventura	7	5	12
San Diego	1	0	1
Kern	30	20	50
Orange	265	273	538
Los Angeles	1,082	2,322	3,405
Total	4,749	6,027	10,776
Region Total	4,749	6,027	10,776

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

Casualties Summary Report

February 07, 2008

Injury Severity Level					
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Imperial					
Casualties - 2am					
Commercial	0	0	0	0	0
Other-Residential	35	6	0	0	41
Educational	0	0	0	0	0
Single Family	1	0	0	0	1
Commuting	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Total Casualties - 2am	36	6	0	0	42
Casualties - 2pm					
Educational	0	0	0	0	0
Industrial	0	0	0	0	1
Hotels	0	0	0	0	0
Other-Residential	12	2	0	0	14
Single Family	0	0	0	0	0
Commercial	1	0	0	0	1
Commuting	0	0	0	0	0
Total Casualties - 2pm	14	2	0	0	16
Casualties - 5pm					
Single Family	0	0	0	0	0
Other-Residential	12	2	0	0	15
Commuting	0	0	0	0	0
Commercial	1	0	0	0	1
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Total Casualties - 5pm	14	2	0	0	16
Kern					
Casualties - 2am					
Commercial	0	0	0	0	0
Single Family	2	0	0	0	2
Other-Residential	82	17	1	2	103
Commuting	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Total Casualties - 2am	85	18	1	2	105
Casualties - 2pm					
Educational	1	0	0	0	1
Commuting	0	0	0	0	0

Injury Severity Level					
Severity 1	Severity 2	Severity 3	Severity 4	Total	

California

Kern

Casualties - 2pm

Single Family	0	0	0	0	0
Hotels	0	0	0	0	0
Other-Residential	16	3	0	0	20
Commercial	4	0	0	0	4
Industrial	2	0	0	0	2

Total Casualties - 2pm	23	4	0	0	28
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Casualties - 5pm

Single Family	1	0	0	0	1
Commuting	0	0	0	0	0
Commercial	3	0	0	0	4
Other-Residential	29	6	0	1	36
Hotels	0	0	0	0	0
Educational	0	0	0	0	0
Industrial	1	0	0	0	1

Total Casualties - 5pm	35	7	0	1	42
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Los Angeles

Casualties - 2am

Hotels	22	4	1	1	27
Industrial	28	6	1	2	38
Educational	0	0	0	0	0
Other-Residential	1,437	237	17	32	1,723
Single Family	583	39	0	1	624
Commuting	0	0	0	0	0
Commercial	26	5	1	1	33

Total Casualties - 2am	2,096	291	20	37	2,444
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Casualties - 2pm

Industrial	207	47	7	14	276
Other-Residential	308	52	4	7	371
Commercial	1,726	340	44	87	2,197
Educational	211	38	4	8	261
Commuting	0	0	0	0	0
Single Family	115	8	0	0	124
Hotels	4	1	0	0	5

Total Casualties - 2pm	2,572	485	60	116	3,233
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Casualties - 5pm

Other-Residential	550	92	7	12	661
Industrial	130	30	4	9	172
Commuting	0	0	0	0	0
Single Family	217	15	0	0	233
Commercial	1,439	291	39	74	1,843
Hotels	6	1	0	0	8
Educational	30	5	1	1	37

Total Casualties - 5pm	2,372	433	52	96	2,953
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Orange

Injury Severity Level					
Severity 1	Severity 2	Severity 3	Severity 4	Total	

California

Orange

Casualties - 2am

<i>Commuting</i>	0	0	0	0	0
<i>Hotels</i>	5	0	0	0	6
<i>Educational</i>	0	0	0	0	0
<i>Industrial</i>	29	4	0	0	33
<i>Other-Residential</i>	408	51	1	2	463
<i>Commercial</i>	4	0	0	0	4
<i>Single Family</i>	59	1	0	0	60
Total Casualties - 2am	504	56	2	3	564

Casualties - 2pm

<i>Other-Residential</i>	78	10	0	0	89
<i>Industrial</i>	206	28	1	1	236
<i>Single Family</i>	10	0	0	0	10
<i>Commuting</i>	0	0	0	0	0
<i>Commercial</i>	208	19	1	1	229
<i>Hotels</i>	1	0	0	0	1
<i>Educational</i>	25	2	0	0	27
Total Casualties - 2pm	528	59	2	3	592

Casualties - 5pm

<i>Hotels</i>	2	0	0	0	2
<i>Educational</i>	4	0	0	0	4
<i>Commuting</i>	0	0	0	0	0
<i>Single Family</i>	21	0	0	0	21
<i>Commercial</i>	145	13	0	1	160
<i>Other-Residential</i>	146	18	1	1	165
<i>Industrial</i>	129	17	1	1	148
Total Casualties - 5pm	446	50	2	3	500

Riverside

Casualties - 2am

<i>Industrial</i>	54	13	1	2	69
<i>Commercial</i>	16	4	1	1	21
<i>Other-Residential</i>	2,774	650	43	72	3,540
<i>Educational</i>	0	0	0	0	0
<i>Commuting</i>	0	0	0	0	0
<i>Single Family</i>	681	96	4	6	788
<i>Hotels</i>	40	10	1	3	53
Total Casualties - 2am	3,564	772	50	84	4,471

Casualties - 2pm

<i>Commercial</i>	1,130	278	40	77	1,525
<i>Other-Residential</i>	721	170	12	19	922
<i>Educational</i>	281	65	9	17	372
<i>Single Family</i>	166	24	1	2	193
<i>Commuting</i>	0	0	0	0	0
<i>Hotels</i>	8	2	0	0	10
<i>Industrial</i>	388	91	7	11	497

Injury Severity Level					
Severity 1	Severity 2	Severity 3	Severity 4	Total	

California

Riverside

Total Casualties - 2pm	2,695	630	68	127	3,520
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Casualties - 5pm

<i>Industrial</i>	242	57	4	7	310
<i>Other-Residential</i>	1,001	234	16	27	1,279
<i>Educational</i>	23	5	1	1	30
<i>Single Family</i>	264	38	2	3	306
<i>Hotels</i>	12	3	0	1	16
<i>Commercial</i>	942	234	35	64	1,276
<i>Commuting</i>	0	0	0	0	0

Total Casualties - 5pm	2,485	572	58	103	3,217
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San Bernardino

Casualties - 2am

<i>Hotels</i>	28	6	1	2	36
<i>Single Family</i>	1,537	195	6	10	1,749
<i>Commercial</i>	37	9	1	3	50
<i>Commuting</i>	0	0	0	0	0
<i>Educational</i>	0	0	0	0	0
<i>Other-Residential</i>	3,330	781	58	100	4,269
<i>Industrial</i>	65	15	1	2	84

Total Casualties - 2am	4,997	1,007	68	117	6,188
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Casualties - 2pm

<i>Industrial</i>	472	111	9	16	608
<i>Hotels</i>	5	1	0	0	7
<i>Commuting</i>	0	0	0	0	0
<i>Educational</i>	785	178	23	45	1,032
<i>Other-Residential</i>	741	174	14	23	951
<i>Commercial</i>	2,520	651	96	188	3,456
<i>Single Family</i>	339	44	2	2	388

Total Casualties - 2pm	4,862	1,159	145	275	6,441
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Casualties - 5pm

<i>Other-Residential</i>	1,220	286	22	38	1,566
<i>Commercial</i>	2,056	533	79	153	2,822
<i>Single Family</i>	594	77	3	4	678
<i>Educational</i>	82	18	2	5	107
<i>Hotels</i>	8	2	0	0	11
<i>Commuting</i>	0	0	0	0	0
<i>Industrial</i>	295	69	6	10	380

Total Casualties - 5pm	4,256	985	113	210	5,565
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San Diego

Casualties - 2am

<i>Other-Residential</i>	2	0	0	0	2
<i>Commercial</i>	0	0	0	0	0
<i>Single Family</i>	0	0	0	0	0
<i>Commuting</i>	0	0	0	0	0
<i>Educational</i>	0	0	0	0	0

Injury Severity Level					
Severity 1	Severity 2	Severity 3	Severity 4	Total	

California

San Diego

Casualties - 2am

<i>Industrial</i>	0	0	0	0	0
<i>Hotels</i>	0	0	0	0	0

Total Casualties - 2am	2	0	0	0	2
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Casualties - 2pm

<i>Hotels</i>	0	0	0	0	0
<i>Educational</i>	0	0	0	0	0
<i>Commuting</i>	0	0	0	0	0
<i>Commercial</i>	0	0	0	0	0
<i>Other-Residential</i>	0	0	0	0	0
<i>Single Family</i>	0	0	0	0	0
<i>Industrial</i>	0	0	0	0	0

Total Casualties - 2pm	1	0	0	0	1
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Casualties - 5pm

<i>Other-Residential</i>	1	0	0	0	1
<i>Commuting</i>	0	0	0	0	0
<i>Commercial</i>	0	0	0	0	0
<i>Single Family</i>	0	0	0	0	0
<i>Hotels</i>	0	0	0	0	0
<i>Educational</i>	0	0	0	0	0
<i>Industrial</i>	0	0	0	0	0

Total Casualties - 5pm	1	0	0	0	1
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Ventura

Casualties - 2am

<i>Single Family</i>	1	0	0	0	1
<i>Educational</i>	0	0	0	0	0
<i>Commuting</i>	0	0	0	0	0
<i>Hotels</i>	0	0	0	0	0
<i>Industrial</i>	0	0	0	0	0
<i>Other-Residential</i>	17	3	0	0	21
<i>Commercial</i>	0	0	0	0	0

Total Casualties - 2am	18	3	0	0	22
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Casualties - 2pm

<i>Industrial</i>	2	0	0	0	2
<i>Hotels</i>	0	0	0	0	0
<i>Educational</i>	0	0	0	0	0
<i>Commuting</i>	0	0	0	0	0
<i>Other-Residential</i>	3	1	0	0	4
<i>Commercial</i>	1	0	0	0	2
<i>Single Family</i>	0	0	0	0	0

Total Casualties - 2pm	7	1	0	0	8
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Casualties - 5pm

<i>Commuting</i>	0	0	0	0	0
<i>Commercial</i>	1	0	0	0	1
<i>Other-Residential</i>	6	1	0	0	7

Injury Severity Level					
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Ventura					
Casualties - 5pm					
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Single Family	0	0	0	0	0
Industrial	1	0	0	0	1
Total Casualties - 5pm	9	1	0	0	10
Region Total	NA	NA	NA	NA	NA

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

Shelter Summary Report

February 07, 2008

	# of Displaced Households	# of People Needing Short Term Shelter
California		
Riverside	6,883	6,811
San Bernardino	14,942	14,256
Imperial	0	0
Ventura	0	0
San Diego	0	0
Kern	15	11
Orange	184	147
Los Angeles	9,158	8,901
Total	31,182	30,127
Region Total	31,182	30,127

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.