Hazus: Earthquake Global Risk Report

Region Name: OwensValley

Earthquake Scenario: owensvalleyshaw09mod_m7p38_se

Print Date: June 11, 2024

Disclaimer:

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

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.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard 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 multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 16 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 73,243.35 square miles and contains 4,058 census tracts. There are over 5,612 thousand households in the region which has a total population of 16,961,923 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 4,760 thousand buildings in the region with a total building replacement value (excluding contents) of (millions of dollars). Approximately 90.00 % of the buildings (and % of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 219,288 and 185,115 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 4,760 thousand buildings in the region which have an aggregate total replacement value of (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% 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 facilities (HPL). 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 263 hospitals in the region with a total bed capacity of 48,184 beds. There are 5,836 schools, 1,079 fire stations, 367 police stations and 90 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no 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 1 and 2.

The total value of the lifeline inventory is over 404,403.00 (millions of dollars). This inventory includes over 11,100.17 miles of highways, 9,710 bridges, 240,207.74 miles of pipes.

Table 1: Transportation System Lifeline Inventory

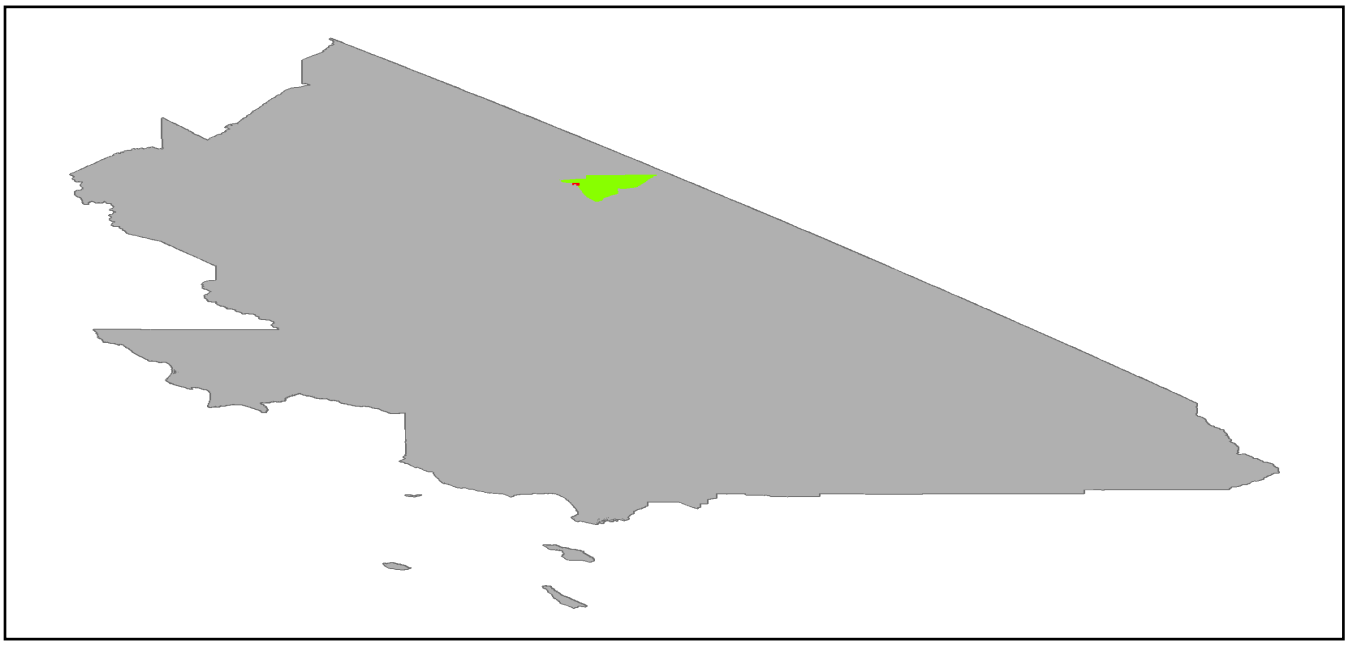
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	9,710	46161.7849
	Segments	7,890	104287.8697
	Tunnels	56	573.3498
		Subtotal	**151023.0044**
Railways	Bridges	1,637	9314.5300
	Facilities	105	279.6150
	Segments	1,796	47494.7497
	Tunnels	0	0.0000
		Subtotal	**57088.8947**
Light Rail	Bridges	28	6.1737
	Facilities	80	2293.5200
	Segments	4	2829.7483
	Tunnels	0	0.0000
		Subtotal	**5129.4420**
Bus	Facilities	42	91.2311
		Subtotal	**91.2311**
Ferry	Facilities	12	15.9720
		Subtotal	**15.9720**
Port	Facilities	229	872.9124
		Subtotal	**872.9124**
Airport	Facilities	145	3490.5592
	Runways	149	1576.3569
		Subtotal	**5066.9161**
		Total	**219,288.40**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4769.9343
	Facilities	33	1296.7020
	Pipelines	0	0.0000
		Subtotal	**6066.6363**
Waste Water	Distribution Lines	NA	2861.9606
	Facilities	82	14100.0476
	Pipelines	0	0.0000
		Subtotal	**16962.0082**
Natural Gas	Distribution Lines	NA	1907.9737
	Facilities	34	1249.7760
	Pipelines	424	17549.4607
		Subtotal	**20707.2104**
Oil Systems	Facilities	63	7.4340
	Pipelines	0	0.0000
		Subtotal	**7.4340**
Electrical Power	Facilities	536	141323.3136
		Subtotal	**141323.3136**
Communication	Facilities	413	48.7340
		Subtotal	**48.7340**
		Total	**185,115.30**

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	owensvalleyshaw09mod_m7p38_se
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	7.38
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 1,017 buildings will be at least moderately damaged. This is over 0.00 % of the buildings in the region. There are an estimated 5 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 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

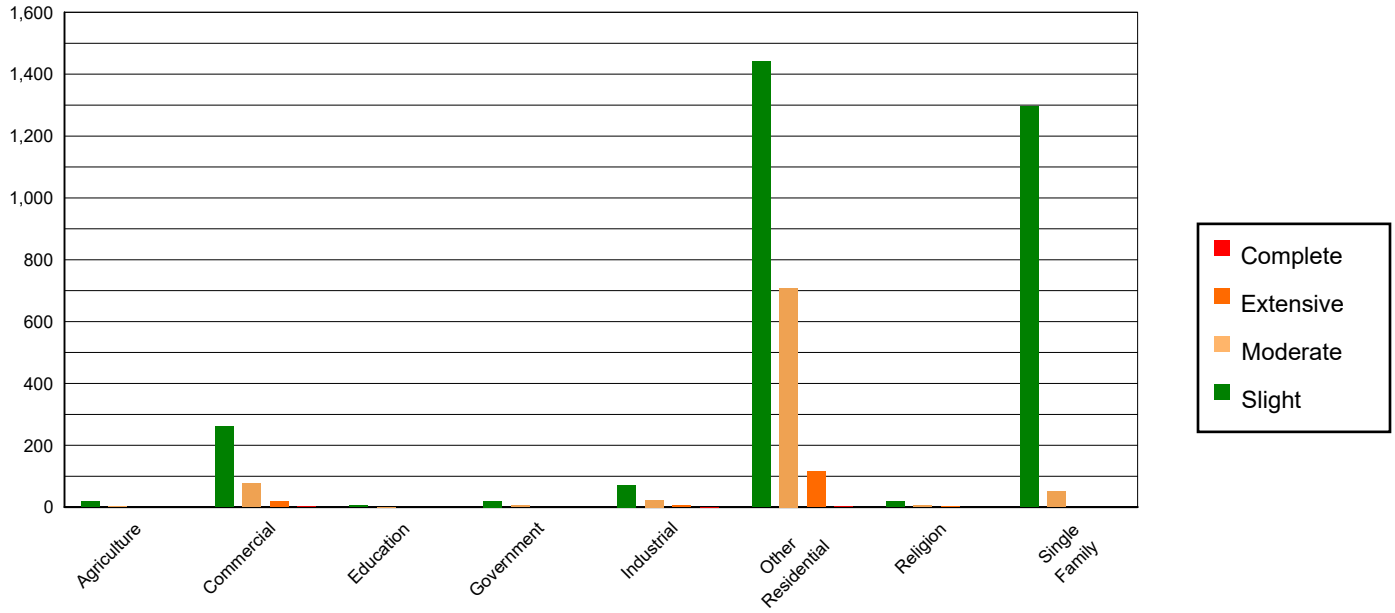


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	26586.17	0.56	19.27	0.62	1.55	0.18	0.01	0.01	0.00	0.00
Commercial	324400.28	6.82	260.70	8.32	77.23	8.85	17.48	12.60	2.31	38.77
Education	9316.19	0.20	4.88	0.16	0.91	0.10	0.02	0.01	0.00	0.00
Government	7956.55	0.17	20.01	0.64	6.05	0.69	0.39	0.28	0.00	0.04
Industrial	91507.52	1.92	71.20	2.27	23.18	2.66	4.52	3.26	0.58	9.71
Other Residential	792625.24	16.66	1442.00	46.04	708.54	81.19	115.27	83.08	2.95	49.56
Religion	19727.70	0.41	18.67	0.60	5.45	0.62	1.06	0.76	0.11	1.92
Single Family	3484566.91	73.26	1295.32	41.36	49.76	5.70	0.00	0.00	0.00	0.00
Total	**4,756,687**		**3,132**		**873**		**139**		**6**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	4178074.35	87.84	1799.20	57.44	84.06	9.63	0.40	0.29	0.01	0.22
Steel	94005.70	1.98	123.42	3.94	55.90	6.41	13.49	9.72	1.97	33.14
Concrete	92869.88	1.95	108.20	3.45	35.90	4.11	11.52	8.30	1.20	20.10
Precast	44304.35	0.93	64.50	2.06	21.36	2.45	2.39	1.72	0.33	5.58
RM	214146.81	4.50	75.15	2.40	19.94	2.29	0.46	0.33	0.00	0.00
URM	29260.82	0.62	59.54	1.90	22.23	2.55	8.15	5.88	1.22	20.41
MH	104024.66	2.19	902.05	28.80	633.30	72.57	102.32	73.75	1.22	20.56
Total	**4,756,687**		**3,132**		**873**		**139**		**6**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 48,184 hospital beds available for use. On the day of the earthquake, the model estimates that only 47,890 hospital beds (99.00%) 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 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	263	1	0	261
Schools	5,836	9	0	5,818
EOCs	90	0	0	89
PoliceStations	367	0	0	366
FireStations	1,079	1	0	1,071

Transportation Lifeline Damage

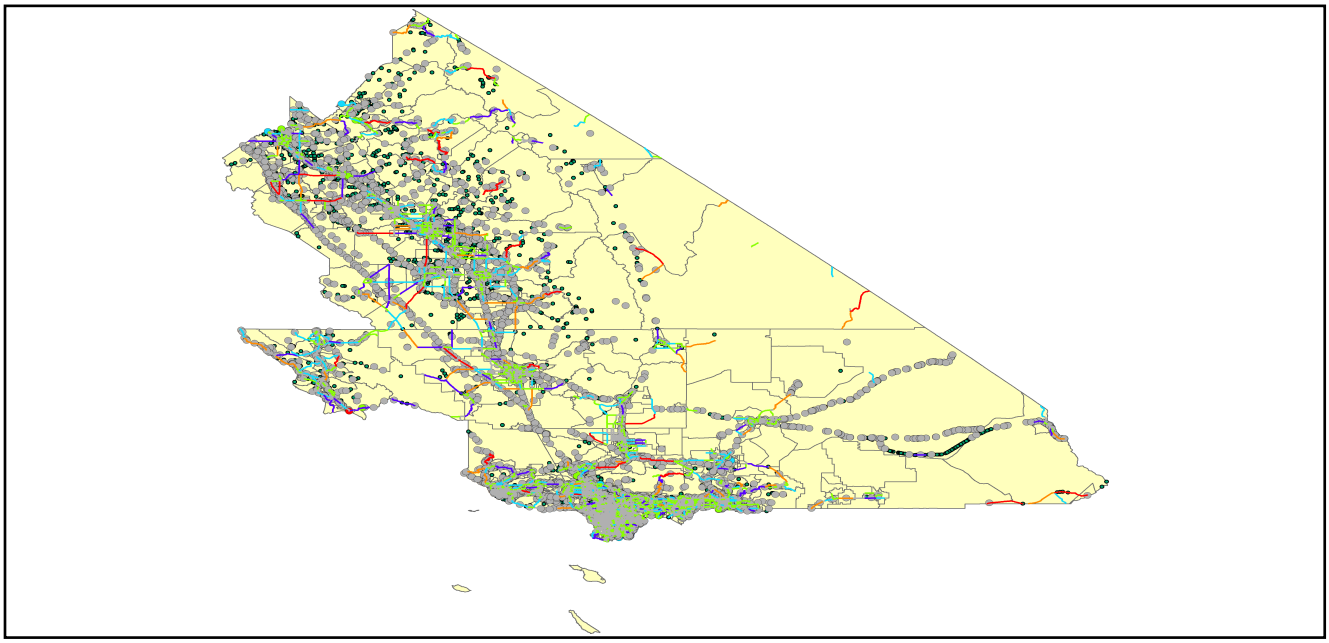


Table 6: Expected Damage to the Transportation Systems

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	7,890	0	0	7,890	7,890
	Bridges	9,710	4	0	9,707	9,707
	Tunnels	56	0	0	56	56
Railways	Segments	1,796	0	0	1,796	1,796
	Bridges	1,637	0	0	1,637	1,637
	Tunnels	0	0	0	0	0
	Facilities	105	0	0	105	105
Light Rail	Segments	4	0	0	4	4
	Bridges	28	0	0	28	28
	Tunnels	0	0	0	0	0
	Facilities	80	0	0	80	80
Bus	Facilities	42	0	0	42	42
Ferry	Facilities	12	0	0	12	12
Port	Facilities	229	0	0	229	229
Airport	Facilities	145	2	0	145	145
	Runways	149	0	0	149	149

Table 6 provides damage estimates for the transportation system.

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 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 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 9 provides a summary of the system performance information.

Table 7 : 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	33	0	0	33	33
Waste Water	82	0	0	82	82
Natural Gas	34	0	0	34	34
Oil Systems	63	0	0	63	63
Electrical Power	536	7	0	531	535
Communication	413	4	0	412	413

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	148,195	826	207
Waste Water	88,917	415	104
Natural Gas	3,096	0	0
Oil	0	0	0

Table 9: 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	5,612,799	15	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

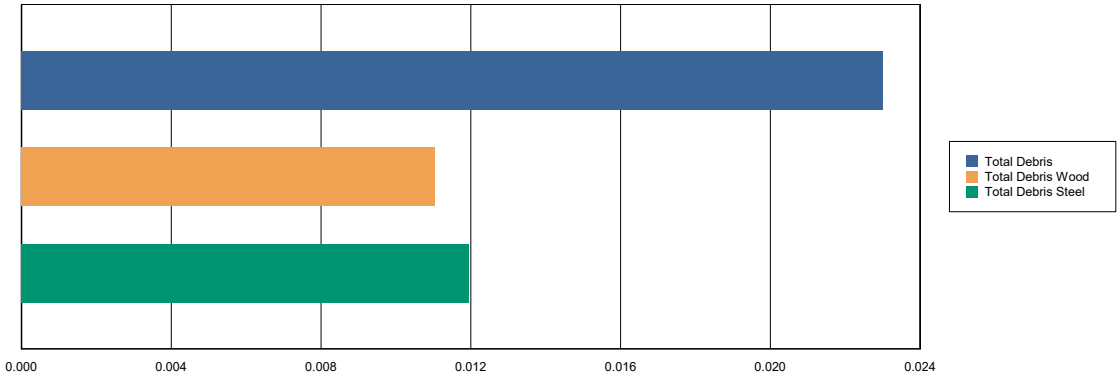
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there 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 23,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 48.00% 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 920 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



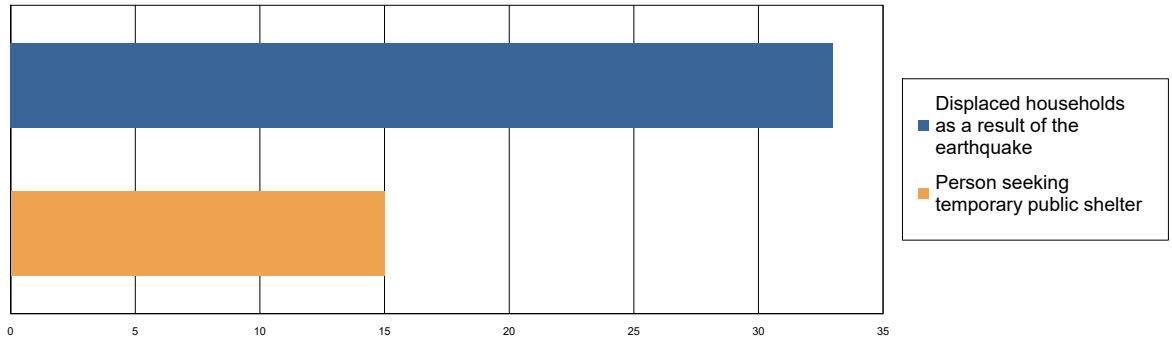
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.01	0.01	0.02	920 (@25 tons/truck)

Social Impact

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 33 households to be displaced due to the earthquake. Of these, 15 people (out of a total population of 16,961,923) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
33	15

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 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.15	0.02	0.00	0.00
	Commuting	0.01	0.01	0.01	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.01	0.00	0.00	0.00
	Industrial	0.12	0.02	0.00	0.00
	Other-Residential	9.35	1.02	0.05	0.10
	Single Family	1.66	0.03	0.00	0.00
	Total	**11**	**1**	**0**	**0**
2 PM	Commercial	9.12	1.35	0.14	0.28
	Commuting	0.05	0.08	0.11	0.02
	Educational	1.59	0.20	0.02	0.03
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.88	0.11	0.01	0.02
	Other-Residential	2.75	0.31	0.02	0.03
	Single Family	0.49	0.01	0.00	0.00
	Total	**15**	**2**	**0**	**0**
5 PM	Commercial	5.76	0.84	0.09	0.17
	Commuting	0.86	1.62	2.17	0.45
	Educational	0.01	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.55	0.07	0.01	0.01
	Other-Residential	3.39	0.38	0.02	0.04
	Single Family	0.60	0.01	0.00	0.00
	Total	**11**	**3**	**2**	**1**

Economic Loss

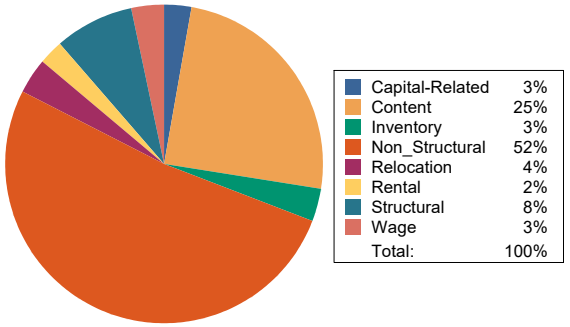
The total economic loss estimated for the earthquake is 1,232.89 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

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 196.21 (millions of dollars); 12 % 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 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

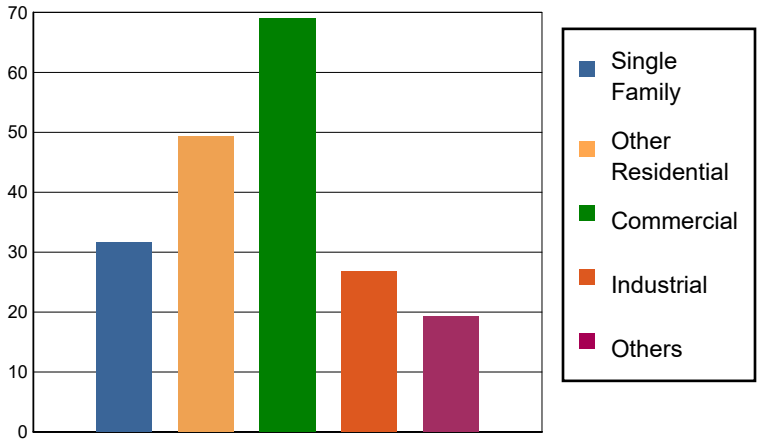


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.5710	4.8996	0.2884	0.5510	6.3100
	Capital-Related	0.0000	0.2424	5.0846	0.1814	0.0577	5.5661
	Rental	0.1658	1.9509	2.3438	0.1206	0.1822	4.7633
	Relocation	0.3390	2.4290	2.8919	0.4592	0.8463	6.9654
	Subtotal	**0.5048**	**5.1933**	**15.2199**	**1.0496**	**1.6372**	**23.6048**
Capital Stock Losses							
	Structural	2.3448	4.8258	5.5851	2.0369	1.2911	16.0837
	Non_Structural	20.3040	31.0070	27.8275	13.0273	9.6668	101.8326
	Content	8.5388	8.2939	16.7866	9.2354	5.7340	48.5887
	Inventory	0.0000	0.0000	3.5830	1.5025	1.0150	6.1005
	Subtotal	**31.1876**	**44.1267**	**53.7822**	**25.8021**	**17.7069**	**172.6055**
	Total	**31.69**	**49.32**	**69.00**	**26.85**	**19.34**	**196.21**

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 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	104287.8697	0.0000	0.00
	Bridges	46161.7849	6.2605	0.01
	Tunnels	573.3498	0.0001	0.00
	Subtotal	**151023.0044**	**6.2606**	
Railways	Segments	47494.7497	0.0000	0.00
	Bridges	9314.5300	0.0004	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	279.6150	0.7845	0.28
	Subtotal	**57088.8947**	**0.7849**	
Light Rail	Segments	2829.7483	0.0000	0.00
	Bridges	6.1737	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	2293.5200	0.0000	0.00
	Subtotal	**5129.4420**	**0.0000**	
Bus	Facilities	91.2311	0.4838	0.53
	Subtotal	**91.2311**	**0.4838**	
Ferry	Facilities	15.9720	0.0000	0.00
	Subtotal	**15.9720**	**0.0000**	
Port	Facilities	872.9124	0.0041	0.00
	Subtotal	**872.9124**	**0.0041**	
Airport	Facilities	3490.5592	11.7364	0.34
	Runways	1576.3569	0.0000	0.00
	Subtotal	**5066.9161**	**11.7364**	
	Total	**219,288.37**	**19.27**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	1296.7020	0.1153	0.01
	Distribution Lines	4769.9343	3.7181	0.08
	Subtotal	**6066.6363**	**3.8334**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	14100.0476	1.8751	0.01
	Distribution Lines	2861.9606	1.8677	0.07
	Subtotal	**16962.0082**	**3.7428**	
Natural Gas	Pipelines	17549.4607	0.0000	0.00
	Facilities	1249.7760	0.2343	0.02
	Distribution Lines	1907.9737	0.6399	0.03
	Subtotal	**20707.2104**	**0.8742**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	7.4340	0.0013	0.02
	Subtotal	**7.4340**	**0.0013**	
Electrical Power	Facilities	141323.3136	1008.7044	0.71
	Subtotal	**141323.3136**	**1008.7044**	
Communication	Facilities	48.7340	0.2481	0.51
	Subtotal	**48.7340**	**0.2481**	
	Total	**185,115.34**	**1,017.40**	

Appendix A: County Listing for the Region

Alpine,CA

Fresno,CA

Inyo,CA

Kern,CA

Kings,CA

Los Angeles,CA

Madera,CA

Mariposa,CA

Merced,CA

Mono,CA

San Bernardino,CA

San Luis Obispo,CA

Stanislaus,CA

Tulare,CA

Tuolumne,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					
	Alpine	1,204	721	139	861
	Fresno	1,008,654	98,532	61,772	160,304
	Inyo	19,016	2,951	1,970	4,921
	Kern	909,235	87,567	59,168	146,736
	Kings	152,486	13,719	7,861	21,581
	Los Angeles	10,014,009	950,697	566,995	1,517,692
	Madera	156,255	18,025	9,641	27,667
	Mariposa	17,131	3,299	1,141	4,441
	Merced	281,202	25,194	26,098	51,292
	Mono	13,195	3,293	1,083	4,377
	San Bernardino	2,181,654	225,045	152,557	377,602
	San Luis Obispo	282,424	41,720	20,896	62,616
	Stanislaus	552,878	62,937	37,511	100,449
	Tulare	473,117	43,262	31,210	74,472
	Tuolumne	55,620	8,964	3,507	12,471
	Ventura	843,843	99,299	52,072	151,371
Total Region		**16,961,923**	**1,685,225**	**1,033,621**	**2,718,853**

Owens Valley

Building Inspection Tagging (Counts)

Inspected		Restricted		Unsafe	
Residential	758	Residential	115	Residential	2.95
Commercial	77.2	Commercial	17.5	Commercial	2.31
Industrial	23.2	Industrial	4.52	Industrial	0.578
Agricultural	1.55	Agricultural	0.0105	Agricultural	0
Educational	0.913	Educational	0.0204	Educational	0
Government	6.05	Government	0.386	Government	0.00228
Religious	5.45	Religious	1.06	Religious	0.114

Total Economic Loss

Total: $196M

Top Counties	State	Total
Inyo	CA	$140M
Fresno	CA	$18.4M
Tulare	CA	$18.1M
Kern	CA	$14.4M
Mono	CA	$1.59M
Madera	CA	$1.31M
Kings	CA	$1.11M

Injuries & Fatalities

Total Day: 17.6
Total Night: 12.6

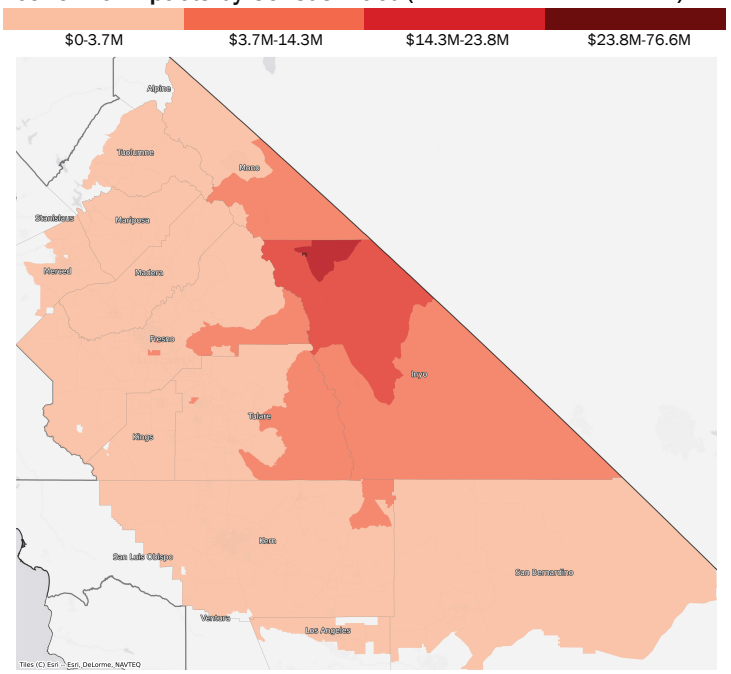
Top Counties	State	Injuries (day/night)	Fatalities (day/night)
Inyo	CA	15.7/11.3	0.381/0.106
Tulare	CA	0.538/0.404	0.000092/0.000029
Fresno	CA	0.497/0.29	0.000104/0.000023
Kern	CA	0.423/0.437	0.00005/0.000019
Mono	CA	0.0252/0.0368	0.000002/0.000001
Madera	CA	0.0147/0.0116	0.000005/0.000005
Kings	CA	0.0147/0.00448	0.000007/0.000001

Displaced Households & Short-Term Shelter Needs

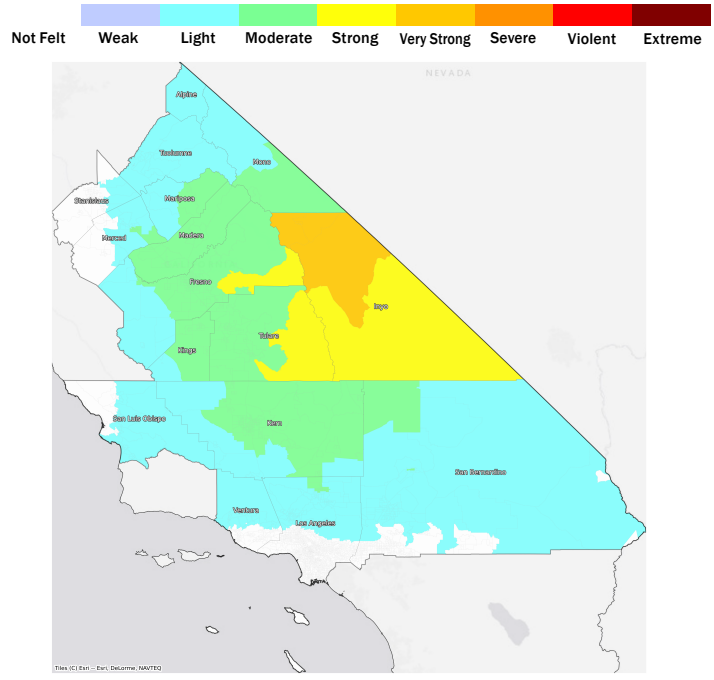
Total Displaced: 33.1
Total Needing Shelter: 15.4

Top Counties	State	Displaced	Needing Shelter
Inyo	CA	33.1	15.4
Fresno	CA	0.00773	0.0126
Tulare	CA	0.00555	0.00446
Kern	CA	0.000662	0.000411
Mono	CA	0.000612	0.000284
Alpine	CA	0	0
Kings	CA	0	0

Economic Impacts by Census Tract (729 Tracts with Losses)



Ground Shaking



Debris

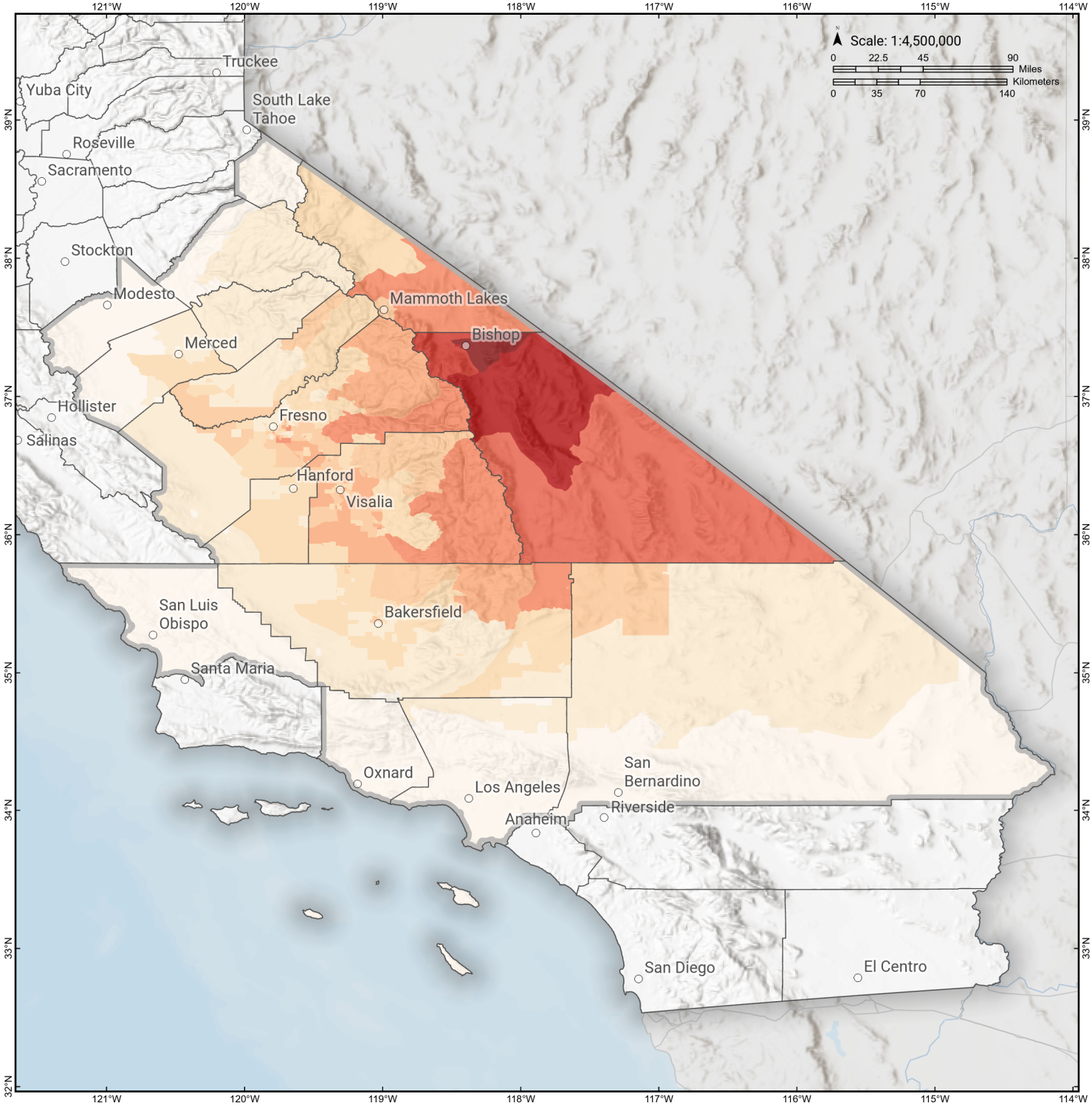
Total Tons: 23.8K
Total Truckloads: 953

Type	Tons
Brick, Wood, and Other	11.5K
Concrete & Steel	12.3K

Owens Valley

Debris Generated by Census Tract

California Department of Conservation
California Geological Survey



Study Region: Owens Valley
Scenario: owensvalleyshaw09mod_m7p38_se

Debris Generated *(in tons)*

- 0
- >0 - 1
- >1 - 5
- >5 - 10
- >10 - 25
- >25 - 100
- >100 - 300
- >300 - 1,000
- >1,000 - 3,000
- >3,000 - 14,000

Owens Valley

Displaced Households by Census Tract

California Department of Conservation
California Geological Survey

Study Region: Owens Valley
Scenario: owensvalleyshaw09mod_m7p38_se

Displaced Households

- 0
- 1
- 2 - 30

Owens Valley

Loss Ratio by Census Tract

California Department of Conservation
California Geological Survey

Study Region: Owens Valley
Scenario: owensvalleyshaw09mod_m7p38_se

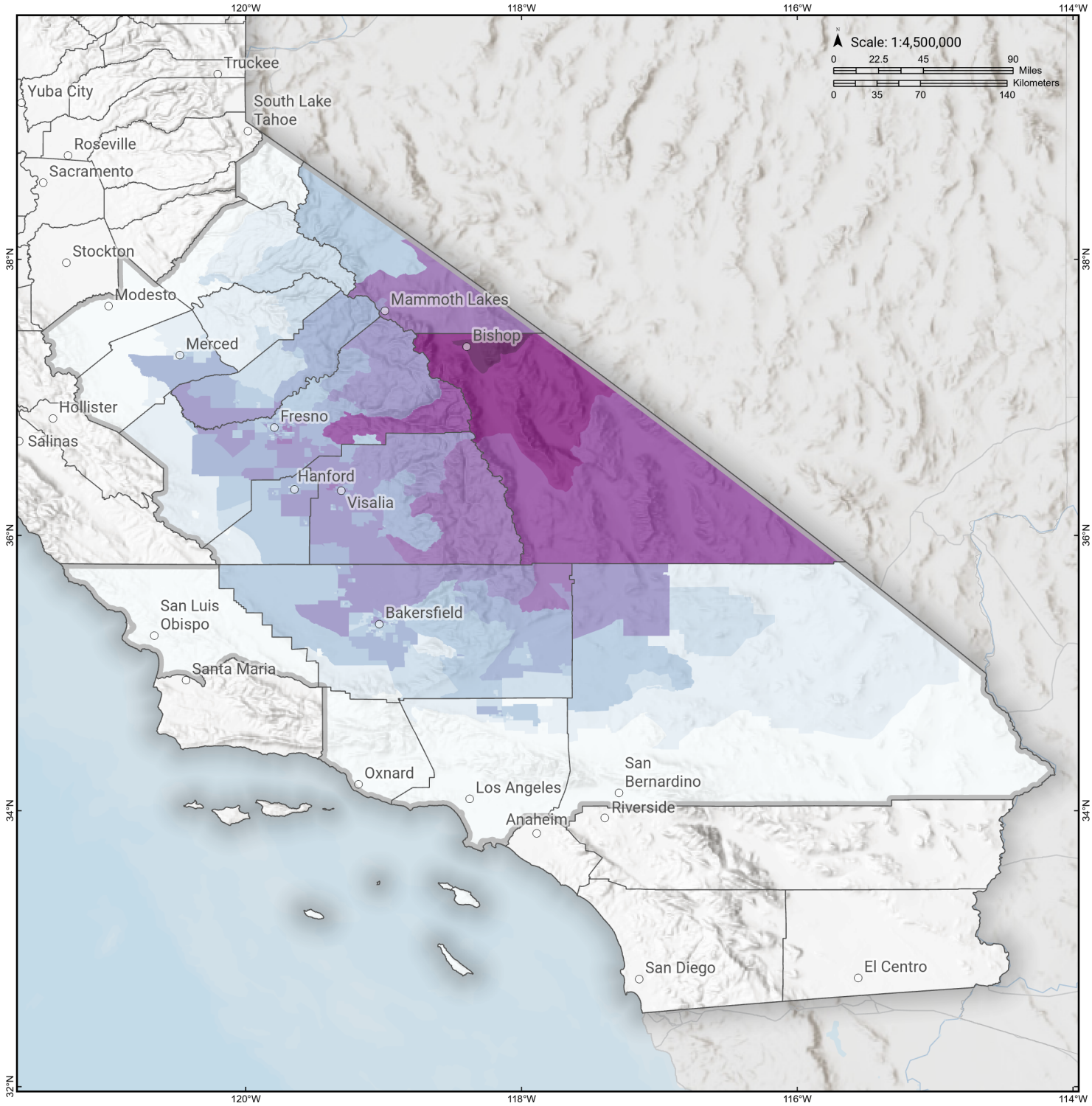
Loss Ratio *(ratio of building related economic loss to exposed value of buildings)*

- 0%
- >0 - 1%
- >1 - 6%

Owens Valley

Total Building Related Economic Loss by Census Tract

California Department of Conservation
California Geological Survey



Study Region: Owens Valley
Scenario: owensvalleyshaw09mod_m7p38_se

Economic Loss *(in thousands of USD $)*

0	>100 - 500
>0 - 2.5	>500 - 1,500
>2.5 - 10	>1,500 - 6,000
>10 - 35	>6,000 - 20,000
>35 - 100	>20,000 - 77,000

Building Damage by Count by General Occupancy

RiskMAP
Increasing Resilience Together

June 11, 2024

	# of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
California						
Alpine						
Agriculture	0	0	0	0	0	0
Commercial	48	0	0	0	0	48
Education	5	0	0	0	0	5
Government	4	0	0	0	0	4
Industrial	14	0	0	0	0	14
Religion	1	0	0	0	0	1
Other Residential	97	0	0	0	0	97
Single Family	842	0	0	0	0	842
Fresno						
Agriculture	3,418	3	0	0	0	3,421
Commercial	21,023	29	2	0	0	21,054
Education	602	0	0	0	0	602
Government	290	1	0	0	0	291
Industrial	5,340	8	0	0	0	5,348
Religion	1,504	3	0	0	0	1,507
Other Residential	40,877	91	5	0	0	40,973
Single Family	226,375	50	0	0	0	226,425
Inyo						

		# of Buildings					
		None	Slight	Moderate	Extensive	Complete	Total
	Agriculture	*27*	*4*	*1*	*0*	*0*	*32*
	Commercial	*445*	*183*	*73*	*17*	*2*	*721*
	Education	*36*	*4*	*1*	*0*	*0*	*41*
	Government	*77*	*18*	*6*	*0*	*0*	*101*
	Industrial	*180*	*50*	*22*	*5*	*1*	*257*
	Religion	*40*	*11*	*5*	*1*	*0*	*57*
	Other Residential	*2,241*	*1,008*	*683*	*115*	*3*	*4,050*
	Single Family	*3,365*	*1,031*	*50*	*0*	*0*	*4,446*
Kern							
	Agriculture	*4,643*	*2*	*0*	*0*	*0*	*4,645*
	Commercial	*15,548*	*18*	*1*	*0*	*0*	*15,567*
	Education	*462*	*0*	*0*	*0*	*0*	*462*
	Government	*443*	*0*	*0*	*0*	*0*	*443*
	Industrial	*6,041*	*6*	*0*	*0*	*0*	*6,047*
	Religion	*1,522*	*2*	*0*	*0*	*0*	*1,524*
	Other Residential	*54,317*	*191*	*12*	*0*	*0*	*54,520*
	Single Family	*205,038*	*101*	*0*	*0*	*0*	*205,139*
Kings							
	Agriculture	*306*	*0*	*0*	*0*	*0*	*306*
	Commercial	*2,317*	*1*	*0*	*0*	*0*	*2,318*
	Education	*103*	*0*	*0*	*0*	*0*	*103*
	Government	*72*	*0*	*0*	*0*	*0*	*72*
	Industrial	*555*	*0*	*0*	*0*	*0*	*555*
	Religion	*210*	*0*	*0*	*0*	*0*	*210*
	Other Residential	*4,340*	*2*	*0*	*0*	*0*	*4,342*

	# of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Single Family	*36,245*	*0*	*0*	*0*	*0*	*36,245*
Los Angeles						
Agriculture	*2,032*	*0*	*0*	*0*	*0*	*2,032*
Commercial	*190,861*	*0*	*0*	*0*	*0*	*190,861*
Education	*5,486*	*0*	*0*	*0*	*0*	*5,486*
Government	*3,031*	*0*	*0*	*0*	*0*	*3,031*
Industrial	*53,126*	*0*	*0*	*0*	*0*	*53,126*
Religion	*10,651*	*0*	*0*	*0*	*0*	*10,651*
Other Residential	*481,669*	*2*	*0*	*0*	*0*	*481,671*
Single Family	*1,803,140*	*0*	*0*	*0*	*0*	*1,803,140*
Madera						
Agriculture	*634*	*0*	*0*	*0*	*0*	*634*
Commercial	*2,904*	*1*	*0*	*0*	*0*	*2,905*
Education	*115*	*0*	*0*	*0*	*0*	*115*
Government	*111*	*0*	*0*	*0*	*0*	*111*
Industrial	*903*	*0*	*0*	*0*	*0*	*903*
Religion	*119*	*0*	*0*	*0*	*0*	*119*
Other Residential	*6,632*	*3*	*0*	*0*	*0*	*6,635*
Single Family	*38,912*	*0*	*0*	*0*	*0*	*38,912*
Mariposa						
Agriculture	*29*	*0*	*0*	*0*	*0*	*29*
Commercial	*689*	*0*	*0*	*0*	*0*	*689*
Education	*27*	*0*	*0*	*0*	*0*	*27*
Government	*33*	*0*	*0*	*0*	*0*	*33*
Industrial	*94*	*0*	*0*	*0*	*0*	*94*

		# of Buildings					
		None	Slight	Moderate	Extensive	Complete	Total
	Religion	*36*	*0*	*0*	*0*	*0*	*36*
	Other Residential	*307*	*0*	*0*	*0*	*0*	*307*
	Single Family	*8,084*	*0*	*0*	*0*	*0*	*8,084*
Merced							
	Agriculture	*7,652*	*1*	*0*	*0*	*0*	*7,653*
	Commercial	*4,754*	*0*	*0*	*0*	*0*	*4,754*
	Education	*163*	*0*	*0*	*0*	*0*	*163*
	Government	*171*	*0*	*0*	*0*	*0*	*171*
	Industrial	*1,022*	*0*	*0*	*0*	*0*	*1,022*
	Religion	*345*	*0*	*0*	*0*	*0*	*345*
	Other Residential	*10,786*	*1*	*0*	*0*	*0*	*10,787*
	Single Family	*63,598*	*0*	*0*	*0*	*0*	*63,598*
Mono							
	Agriculture	*144*	*1*	*0*	*0*	*0*	*145*
	Commercial	*652*	*2*	*0*	*0*	*0*	*654*
	Education	*21*	*0*	*0*	*0*	*0*	*21*
	Government	*18*	*0*	*0*	*0*	*0*	*18*
	Industrial	*107*	*1*	*0*	*0*	*0*	*108*
	Religion	*32*	*0*	*0*	*0*	*0*	*32*
	Other Residential	*1,728*	*29*	*2*	*0*	*0*	*1,759*
	Single Family	*7,694*	*10*	*0*	*0*	*0*	*7,704*
San Bernardino							
	Agriculture	*1,815*	*0*	*0*	*0*	*0*	*1,815*
	Commercial	*40,041*	*0*	*0*	*0*	*0*	*40,041*
	Education	*985*	*0*	*0*	*0*	*0*	*985*

	# of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Government	*1,238*	*0*	*0*	*0*	*0*	*1,238*
Industrial	*9,474*	*0*	*0*	*0*	*0*	*9,474*
Religion	*2,320*	*0*	*0*	*0*	*0*	*2,320*
Other Residential	*98,819*	*2*	*0*	*0*	*0*	*98,821*
Single Family	*525,366*	*1*	*0*	*0*	*0*	*525,367*
San Luis Obispo						
Agriculture	*421*	*0*	*0*	*0*	*0*	*421*
Commercial	*9,375*	*0*	*0*	*0*	*0*	*9,375*
Education	*182*	*0*	*0*	*0*	*0*	*182*
Government	*185*	*0*	*0*	*0*	*0*	*185*
Industrial	*2,556*	*0*	*0*	*0*	*0*	*2,556*
Religion	*360*	*0*	*0*	*0*	*0*	*360*
Other Residential	*20,216*	*0*	*0*	*0*	*0*	*20,216*
Single Family	*85,639*	*0*	*0*	*0*	*0*	*85,639*
Stanislaus						
Agriculture	*1,239*	*0*	*0*	*0*	*0*	*1,239*
Commercial	*10,369*	*0*	*0*	*0*	*0*	*10,369*
Education	*307*	*0*	*0*	*0*	*0*	*307*
Government	*680*	*0*	*0*	*0*	*0*	*680*
Industrial	*3,475*	*0*	*0*	*0*	*0*	*3,475*
Religion	*456*	*0*	*0*	*0*	*0*	*456*
Other Residential	*19,569*	*0*	*0*	*0*	*0*	*19,569*
Single Family	*142,724*	*0*	*0*	*0*	*0*	*142,724*
Tulare						
Agriculture	*3,546*	*8*	*0*	*0*	*0*	*3,555*

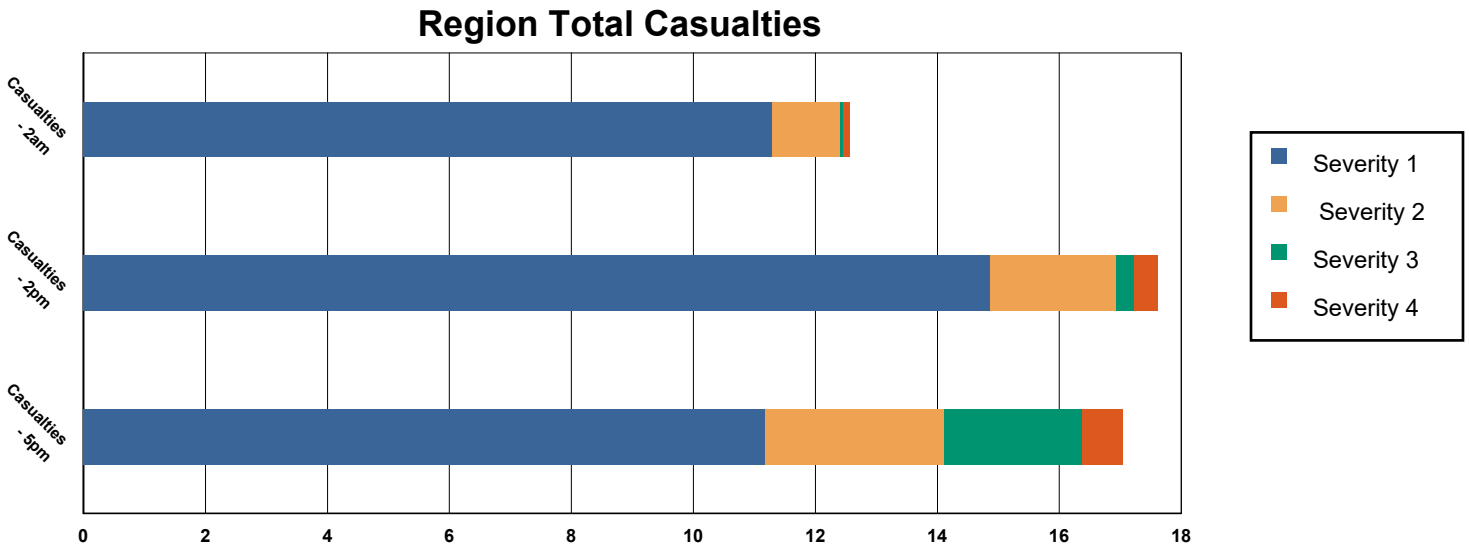
	# of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Commercial	*8,846*	*26*	*1*	*0*	*0*	*8,873*
Education	*269*	*0*	*0*	*0*	*0*	*269*
Government	*460*	*1*	*0*	*0*	*0*	*461*
Industrial	*2,141*	*6*	*0*	*0*	*0*	*2,148*
Religion	*825*	*2*	*0*	*0*	*0*	*827*
Other Residential	*19,902*	*114*	*6*	*0*	*0*	*20,022*
Single Family	*111,932*	*102*	*0*	*0*	*0*	*112,034*
Tuolumne						
Agriculture	*82*	*0*	*0*	*0*	*0*	*82*
Commercial	*1,576*	*0*	*0*	*0*	*0*	*1,576*
Education	*57*	*0*	*0*	*0*	*0*	*57*
Government	*143*	*0*	*0*	*0*	*0*	*143*
Industrial	*383*	*0*	*0*	*0*	*0*	*383*
Religion	*121*	*0*	*0*	*0*	*0*	*121*
Other Residential	*4,962*	*0*	*0*	*0*	*0*	*4,962*
Single Family	*21,645*	*0*	*0*	*0*	*0*	*21,645*
Ventura						
Agriculture	*598*	*0*	*0*	*0*	*0*	*598*
Commercial	*14,953*	*0*	*0*	*0*	*0*	*14,953*
Education	*497*	*0*	*0*	*0*	*0*	*497*
Government	*1,001*	*0*	*0*	*0*	*0*	*1,001*
Industrial	*6,097*	*0*	*0*	*0*	*0*	*6,097*
Religion	*1,187*	*0*	*0*	*0*	*0*	*1,187*
Other Residential	*26,163*	*0*	*0*	*0*	*0*	*26,163*

	# of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Single Family	*203,968*	*0*	*0*	*0*	*0*	*203,968*
Total	**4,756,687**	**3,132**	**873**	**139**	**6**	**4,760,836**
Region Total	**4,756,687**	**3,132**	**873**	**139**	**6**	**4,760,836**

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

June 11, 2024



	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Alpine					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Alpine					
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Fresno					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Inyo					
Casualties - 2am					
Commuting	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Inyo					
Casualties - 2am					
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	9	1	0	0	10
Single Family	1	0	0	0	1
Total Casualties - 2am	**10**	**1**	**0**	**0**	**11**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	8	1	0	0	10
Educational	1	0	0	0	2
Hotels	0	0	0	0	0
Industrial	1	0	0	0	1
Other-Residential	2	0	0	0	3
Single Family	0	0	0	0	0
Total Casualties - 2pm	**13**	**2**	**0**	**0**	**16**
Casualties - 5pm					
Commuting	1	2	2	0	5
Commercial	5	1	0	0	6
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	1
Other-Residential	3	0	0	0	4
Single Family	0	0	0	0	0
Total Casualties - 5pm	**10**	**3**	**2**	**1**	**16**
Kern					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Kern					
Casualties - 2pm					
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Kings					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Los Angeles					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Madera					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Madera					
Casualties - 2pm					
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Mariposa					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Mariposa					
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Merced					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Mono					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Mono					
Casualties - 2pm					
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
San Bernardino					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
San Bernardino					
Casualties - 5pm					
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
San Luis Obispo					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Stanislaus					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Stanislaus					
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Tulare					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**1**	**0**	**0**	**0**	**1**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Tulare					
Casualties - 5pm					
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Tuolumne					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
Ventura					
Casualties - 2am					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0

	Injury Severity Level				
	Severity 1	Severity 2	Severity 3	Severity 4	Total
California					
Ventura					
Casualties - 2am					
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2am	**0**	**0**	**0**	**0**	**0**
Casualties - 2pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 2pm	**0**	**0**	**0**	**0**	**0**
Casualties - 5pm					
Commuting	0	0	0	0	0
Commercial	0	0	0	0	0
Educational	0	0	0	0	0
Hotels	0	0	0	0	0
Industrial	0	0	0	0	0
Other-Residential	0	0	0	0	0
Single Family	0	0	0	0	0
Total Casualties - 5pm	**0**	**0**	**0**	**0**	**0**
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.

Debris Summary Report

June 11, 2024

All values are in thousands of tons.

	Brick, Wood & Others	Concrete & Steel	Total
California			
Alpine	0	0	0
Fresno	1	0	1
Inyo	10	12	21
Kern	1	0	1
Kings	0	0	0
Los Angeles	0	0	0
Madera	0	0	0
Mariposa	0	0	0
Merced	0	0	0
Mono	0	0	0
San Bernardino	0	0	0
San Luis Obispo	0	0	0
Stanislaus	0	0	0
Tulare	1	0	1
Tuolumne	0	0	0
Ventura	0	0	0
Total	**12**	**12**	**24**
Region Total	**12**	**12**	**24**

Study Region : OwensValley

Scenario : owensvalleyshaw09mod_m7p38_se

	Brick, Wood & Others	Concrete & Steel	Total

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

June 11, 2024

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	Rental Income Loss	Total Loss
California										
Inyo	14,178	69,916	30,501	3,227	1.71	6,717	5,267	5,972	4,360	140,136
San Bernardino	6	156	105	19	0.00	1	0	0	1	289
Fresno	593	10,187	6,158	932	0.01	91	143	154	159	18,417
Kings	17	612	409	60	0.00	2	5	5	4	1,114
Tuolumne	0	2	2	0	0.00	0	0	0	0	4
San Luis Obispo	0	0	0	0	0.00	0	0	0	0	0
Tulare	665	10,278	5,683	1,087	0.01	78	92	105	123	18,111
Madera	25	733	462	79	0.00	1	1	1	4	1,307
Alpine	0	0	0	0	0.00	0	0	0	0	0

Study Region : OwensValley

Scenario : owensvalleyshaw09mod_m7p38_se

	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	Rental Income Loss	Total Loss
Merced	10	214	157	47	0.00	1	1	1	1	430
Stanislaus	0	0	0	0	0.00	0	0	0	0	0
Mono	52	980	495	40	0.02	6	4	4	11	1,593
Kern	533	8,541	4,489	599	0.01	68	53	67	99	14,449
Ventura	0	0	0	0	0.00	0	0	0	0	0
Mariposa	0	8	5	0	0.00	0	0	0	0	14
Los Angeles	4	205	124	11	0.00	0	1	1	1	347
Total	**16,084**	**101,833**	**48,589**	**6,101**	**0.11**	**6,966**	**5,566**	**6,310**	**4,763**	**196,212**
Region Total	**16,084**	**101,833**	**48,589**	**6,101**	**0.11**	**6,966**	**5,566**	**6,310**	**4,763**	**196,212**

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 Loss For Transportation

June 11, 2024

All values are in thousands of dollars

	Highway	Railway	Light Rail	Bus Facility	Ports	Ferries	Airport	Total
California								
Alpine								
Segments	0	0	0					0
Bridges	0	0	0					0
Tunnels	0	0	0					0
Facilities		0	0	0	0	0	6	6
Total	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**6**
Fresno								
Segments	0	0	0					0
Bridges	55	0	0					55
Tunnels	0	0	0					0
Facilities		231	0	21	0	0	1,095	1,346
Total	**55**	**231**	**0**	**21**	**0**	**0**	**1,095**	**1,401**
Inyo								
Segments	0	0	0					0
Bridges	6,088	0	0					6,088
Tunnels	0	0	0					0
Facilities		0	0	0	0	0	7,341	7,341

	Highway	Railway	Light Rail	Bus Facility	Ports	Ferries	Airport	Total
Total	**6,088**	**0**	**0**	**0**	**0**	**0**	**7,341**	**13,429**
Kern								
Segments	0	0	0					0
Bridges	55	0	0					55
Tunnels	0	0	0					0
Facilities		180	0	83	0	0	1,537	1,799
Total	**55**	**180**	**0**	**83**	**0**	**0**	**1,537**	**1,854**
Kings								
Segments	0	0	0					0
Bridges	3	0	0					3
Tunnels	0	0	0					0
Facilities		128	0	41	0	0	359	529
Total	**3**	**128**	**0**	**41**	**0**	**0**	**359**	**532**
Los Angeles								
Segments	0	0	0					0
Bridges	1	0	0					1
Tunnels	0	0	0					0
Facilities		3	0	0	0	0	231	234
Total	**1**	**3**	**0**	**0**	**0**	**0**	**231**	**234**
Madera								
Segments	0	0	0					0
Bridges	1	0	0					1
Tunnels	0	0	0					0
Facilities		26	0	21	0	0	102	149

	Highway	Railway	Light Rail	Bus Facility	Ports	Ferries	Airport	Total
Total	**1**	**26**	**0**	**21**	**0**	**0**	**102**	**149**
Mariposa								
Segments	0	0	0					0
Bridges	0	0	0					0
Tunnels	0	0	0					0
Facilities		0	0	86	0	0	6	91
Total	**0**	**0**	**0**	**86**	**0**	**0**	**6**	**92**
Merced								
Segments	0	0	0					0
Bridges	0	0	0					0
Tunnels	0	0	0					0
Facilities		51	0	21	0	0	143	216
Total	**0**	**51**	**0**	**21**	**0**	**0**	**143**	**216**
Mono								
Segments	0	0	0					0
Bridges	1	0	0					1
Tunnels	0	0	0					0
Facilities		0	0	108	0	0	422	529
Total	**1**	**0**	**0**	**108**	**0**	**0**	**422**	**530**
San Bernardino								
Segments	0	0	0					0
Bridges	1	0	0					1
Tunnels	0	0	0					0
Facilities		163	0	21	0	0	184	368

	Highway	Railway	Light Rail	Bus Facility	Ports	Ferries	Airport	Total
Total	**1**	**164**	**0**	**21**	**0**	**0**	**184**	**370**
San Luis Obispo								
Segments	0	0	0					0
Bridges	1	0	0					1
Tunnels	0	0	0					0
Facilities		3	0	0	0	0	39	42
Total	**1**	**3**	**0**	**0**	**0**	**0**	**39**	**42**
Stanislaus								
Segments	0	0	0					0
Bridges	0	0	0					0
Tunnels	0	0	0					0
Facilities		0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Tulare								
Segments	0	0	0					0
Bridges	55	0	0					55
Tunnels	0	0	0					0
Facilities		0	0	83	0	0	255	338
Total	**55**	**0**	**0**	**83**	**0**	**0**	**255**	**393**
Tuolumne								
Segments	0	0	0					0
Bridges	0	0	0					0
Tunnels	0	0	0					0
Facilities		0	0	0	0	0	17	17

	Highway	Railway	Light Rail	Bus Facility	Ports	Ferries	Airport	Total
Total	**0**	**0**	**0**	**0**	**0**	**0**	**17**	**17**
Ventura								
Segments	0	0	0					0
Bridges	0	0	0					0
Tunnels	0	0	0					0
Facilities		0	0	0	4	0	0	4
Total	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**4**
Total	**6,261**	**785**	**0**	**484**	**4**	**0**	**11,736**	**19,270**
Region Total	**6,261**	**785**	**0**	**484**	**4**	**0**	**11,736**	**19,270**

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 Loss For Utilities

June 11, 2024

All values are in thousands of dollars

	Potable Water	Waste Water	Oil Systems	Natural Gas	Electric Power	Communication	Total
California							
Alpine							
Facilities	0	3	0	0	0	0	3
Pipelines	2	1	0	0			2
Total	2	3	0	0	0	0	5
Fresno							
Facilities	0	492	0	13	399,254	7	399,766
Pipelines	267	134	0	0			401
Total	267	626	0	13	399,254	7	400,167
Inyo							
Facilities	0	0	0	0	318,513	213	318,726
Pipelines	1,892	951	0	0			2,843
Total	1,892	951	0	0	318,513	213	321,568
Kern							
Facilities	85	369	1	127	111,179	16	111,777

	Potable Water	Waste Water	Oil Systems	Natural Gas	Electric Power	Communication	Total
Pipelines	474	238	0	0			713
Total	559	607	1	127	111,179	16	112,490
Kings							
Facilities	0	0	0	4	5,844	1	5,849
Pipelines	77	38	0	0			115
Total	77	38	0	4	5,844	1	5,964
Los Angeles							
Facilities	2	8	0	7	12,509	1	12,526
Pipelines	112	56	0	0			168
Total	113	64	0	7	12,509	1	12,694
Madera							
Facilities	0	0	0	0	14,173	1	14,173
Pipelines	90	45	0	0			135
Total	90	45	0	0	14,173	1	14,308
Mariposa							
Facilities	0	492	0	0	42	1	535
Pipelines	30	15	0	0			45
Total	30	507	0	0	42	1	580
Merced							
Facilities	0	131	0	0	175	1	307
Pipelines	49	24	0	0			73

	Potable Water	Waste Water	Oil Systems	Natural Gas	Electric Power	Communication	Total
Total	49	155	0	0	175	1	380
Mono							
Facilities	0	0	0	0	88,632	0	88,632
Pipelines	116	58	0	0			175
Total	116	58	0	0	88,632	0	88,807
San Bernardino							
Facilities	0	3	0	84	52,026	0	52,112
Pipelines	286	144	0	0			429
Total	286	146	0	84	52,026	0	52,541
San Luis Obispo							
Facilities	0	5	0	0	869	0	874
Pipelines	52	26	0	0			78
Total	52	31	0	0	869	0	952
Stanislaus							
Facilities	0	0	0	0	5	0	5
Pipelines	5	2	0	0			7
Total	5	2	0	0	5	0	12
Tulare							
Facilities	28	369	0	0	4,057	7	4,461
Pipelines	216	108	0	0			324
Total	244	477	0	0	4,057	7	4,785

	Potable Water	Waste Water	Oil Systems	Natural Gas	Electric Power	Communication	Total
Tuolumne							
Facilities	0	3	0	0	1,427	0	1,430
Pipelines	23	11	0	0			34
Total	23	14	0	0	1,427	0	1,464
Ventura							
Facilities	1	3	0	0	0	0	3
Pipelines	29	14	0	0			43
Total	29	17	0	0	0	0	47
Total	**3,833**	**3,743**	**1**	**234**	**1,008,704**	**248**	**1,016,764**
Region Total	**3,833**	**3,743**	**1**	**234**	**1,008,704**	**248**	**1,016,764**

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.

Hazus Quick Assessment Report

Estimated Economic Loss ($ Billions)

Category	Description	Range
General Building Stock	Building Damage	0.10 - 0.20
	Building Contents	< 0.1
	Business Interruption	< 0.1
Infrastructure	Lifelines Damage	
	Total	0.10 - 0.40

Preliminary Damage Assessment (PDA) Estimates

Description	Residential	Commercial	Other	Total
Affected	2,700	260	130	3,090
Minor	760	80	30	870
Major	120	20	< 10	140
Destroyed	< 10	< 10	< 10	< 10
Total	3,580	360	160	4,100

Estimated Casualties : Night Time

Severity Level	Description	# Persons
Level 1	Medical Aid	10 - 20
Level 2	Hospital Care	< 10
Level 3	Life-threatening	< 10
Level 4	Fatalities	< 10

Estimated Shelter Needs

Type	Households	People
Displaced Households	20 - 70	50 - 175
Public Shelter	10	20

Comments :

**Hazus damage estimates are presented using FEMA Preliminary Damage Assessment (PDA) categories. These estimates should be used for planning purposes and may not reflect actual observed damages from the PDA process.*

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, goetechnical, and observed ground motion data.

Earthquake Information

Location :

Origin Time:

Magnitude : 7.38

Epicenter Latitude/Longitude :

/

Depth & Type : /U

Name :
NA

Ground Motion /Attenuation :

Maximum PGA: 0.00

Information Sources:

Comments :

Population and Building Exposure

Population: 16,961,923

Building Exposure : ($ Millions)

Residential	1,685,233
Commercial	574,854
Other	458,775
Total	2,718,862

Counties : See Appendix

Major Metro Area :

Time of report: June 11, 2024 4:32 pm

Hazus Quick Assessment Report

Estimated Economic Loss ($ Billions)

Category	Description	Range
General Building Stock	Building Damage	0.10 - 0.20
	Building Contents	< 0.1
	Business Interruption	< 0.1
Infrastructure	Lifelines Damage	
	Total	0.10 - 0.40

Preliminary Damage Assessment (PDA) Estimates

Description	Residential	Commercial	Other	Total
Affected	2,700	260	130	3,090
Minor	760	80	30	870
Major	120	20	< 10	140
Destroyed	< 10	< 10	< 10	< 10
Total	3,580	360	160	4,100

Estimated Casualties : Day Time

Severity Level	Description	# Persons
Level 1	Medical Aid	10 - 30
Level 2	Hospital Care	< 10
Level 3	Life-threatening	< 10
Level 4	Fatalities	< 10

Estimated Shelter Needs

Type	Households	People
Displaced Households	20 - 70	50 - 175
Public Shelter	10	20

Comments :

**Hazus damage estimates are presented using FEMA Preliminary Damage Assessment (PDA) categories. These estimates should be used for planning purposes and may not reflect actual observed damages from the PDA process.*

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, goetechnical, and observed ground motion data.

Earthquake Information

Location :

Origin Time:

Magnitude : 7.38

Epicenter Latitude/Longitude :

/

Depth & Type : /U

Name :
NA

Ground Motion /Attenuation :

Maximum PGA: 0.00

Information Sources:

Comments :

Population and Building Exposure

Population: 16,961,923

Building Exposure : ($ Millions)

Residential	1,685,233
Commercial	574,854
Other	458,775
Total	2,718,862

Counties : See Appendix

Major Metro Area :

Time of report: June 11, 2024 4:32 pm

Hazus Quick Assessment Report

Estimated Economic Loss ($ Billions)

Category	Description	Range
General Building Stock	Building Damage	0.10 - 0.20
	Building Contents	< 0.1
	Business Interruption	< 0.1
Infrastructure	Lifelines Damage	
	Total	0.10 - 0.40

Preliminary Damage Assessment (PDA) Estimates

Description	Residential	Commercial	Other	Total
Affected	2,700	260	130	3,090
Minor	760	80	30	870
Major	120	20	< 10	140
Destroyed	< 10	< 10	< 10	< 10
Total	3,580	360	160	4,100

Estimated Casualties : Commute Time

Severity Level	Description	# Persons
Level 1	Medical Aid	10 - 20
Level 2	Hospital Care	< 10
Level 3	Life-threatening	< 10
Level 4	Fatalities	< 10

Estimated Shelter Needs

Type	Households	People
Displaced Households	20 - 70	50 - 175
Public Shelter	10	20

Comments :

**Hazus damage estimates are presented using FEMA Preliminary Damage Assessment (PDA) categories. These estimates should be used for planning purposes and may not reflect actual observed damages from the PDA process.*

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, goetechnical, and observed ground motion data.

Earthquake Information

Location :

Origin Time:

Magnitude : 7.38

Epicenter Latitude/Longitude :

/

Depth & Type : /U

Name :
NA

Ground Motion /Attenuation :

Maximum PGA: 0.00

Information Sources:

Comments :

Population and Building Exposure

Population: 16,961,923

Building Exposure : ($ Millions)

Residential	1,685,233
Commercial	574,854
Other	458,775
Total	2,718,862

Counties : See Appendix

Major Metro Area :

Time of report: June 11, 2024 4:33 pm

HAZUS™

FEMA

RiskMAP
Increasing Resilience Together

Shelter Summary Report

June 11, 2024

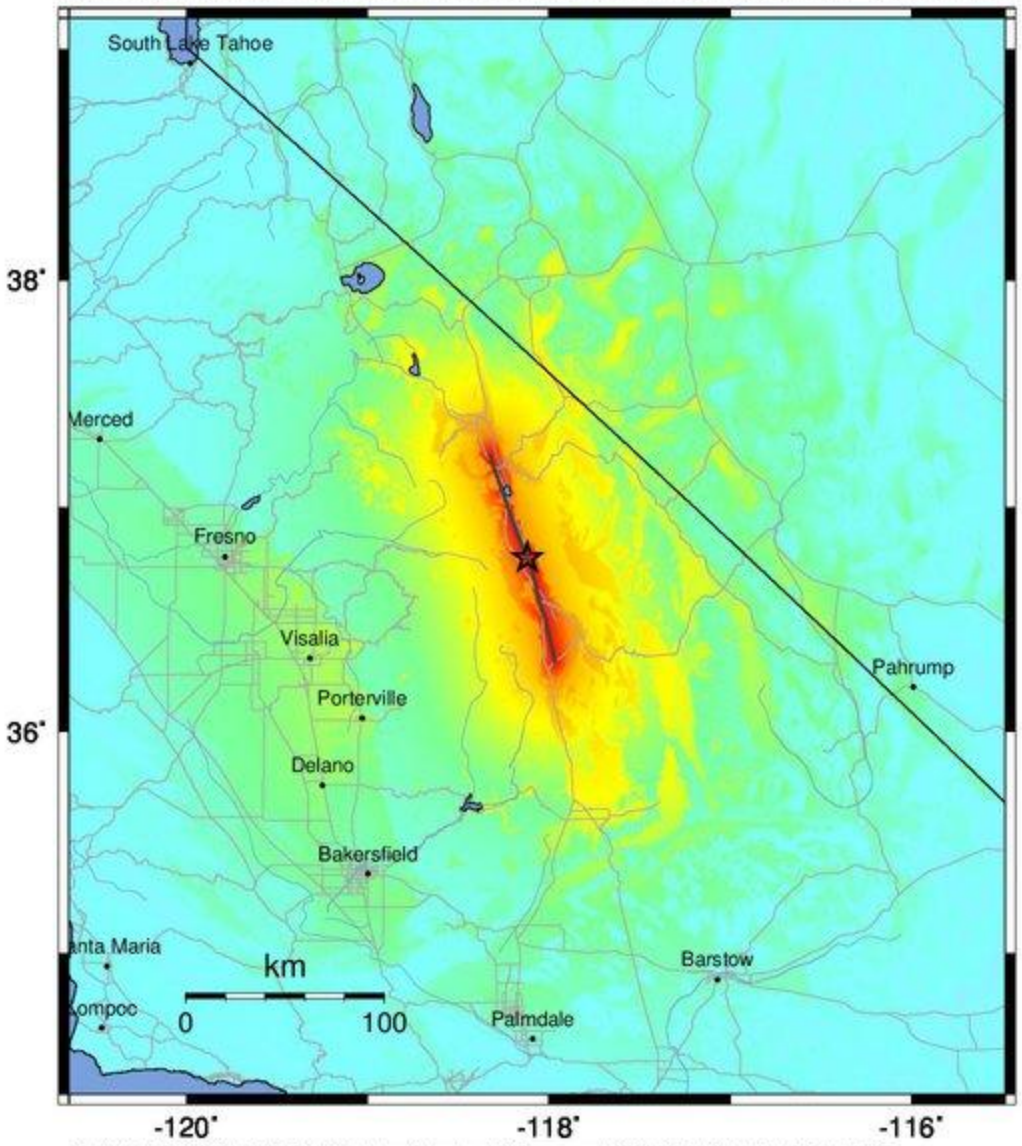
	# of Displaced Households	# of People Needing Short Term Shelter
California		
Alpine	0	0
Fresno	0	0
Inyo	33	15
Kern	0	0
Kings	0	0
Los Angeles	0	0
Madera	0	0
Mariposa	0	0
Merced	0	0
Mono	0	0
San Bernardino	0	0
San Luis Obispo	0	0
Stanislaus	0	0
Tulare	0	0
Tuolumne	0	0
Ventura	0	0
Total	**33**	**15**
Region Total	**33**	**15**

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.

-- Earthquake Planning Scenario --

ShakeMap for Owens Valley - Median ground motions Scenario

Scenario Date: May 16, 2017 08:31:50 AM MDT M 7.4 N36.78 W118.12 Depth: 8.6km



PLANNING SCENARIO ONLY -- Map Version 10 Processed 2017-05-16 11:41:17 PM MDT

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	*<0.02*	*0.1*	*1.4*	*4.7*	*9.6*	*20*	*41*	*86*	*>178*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)