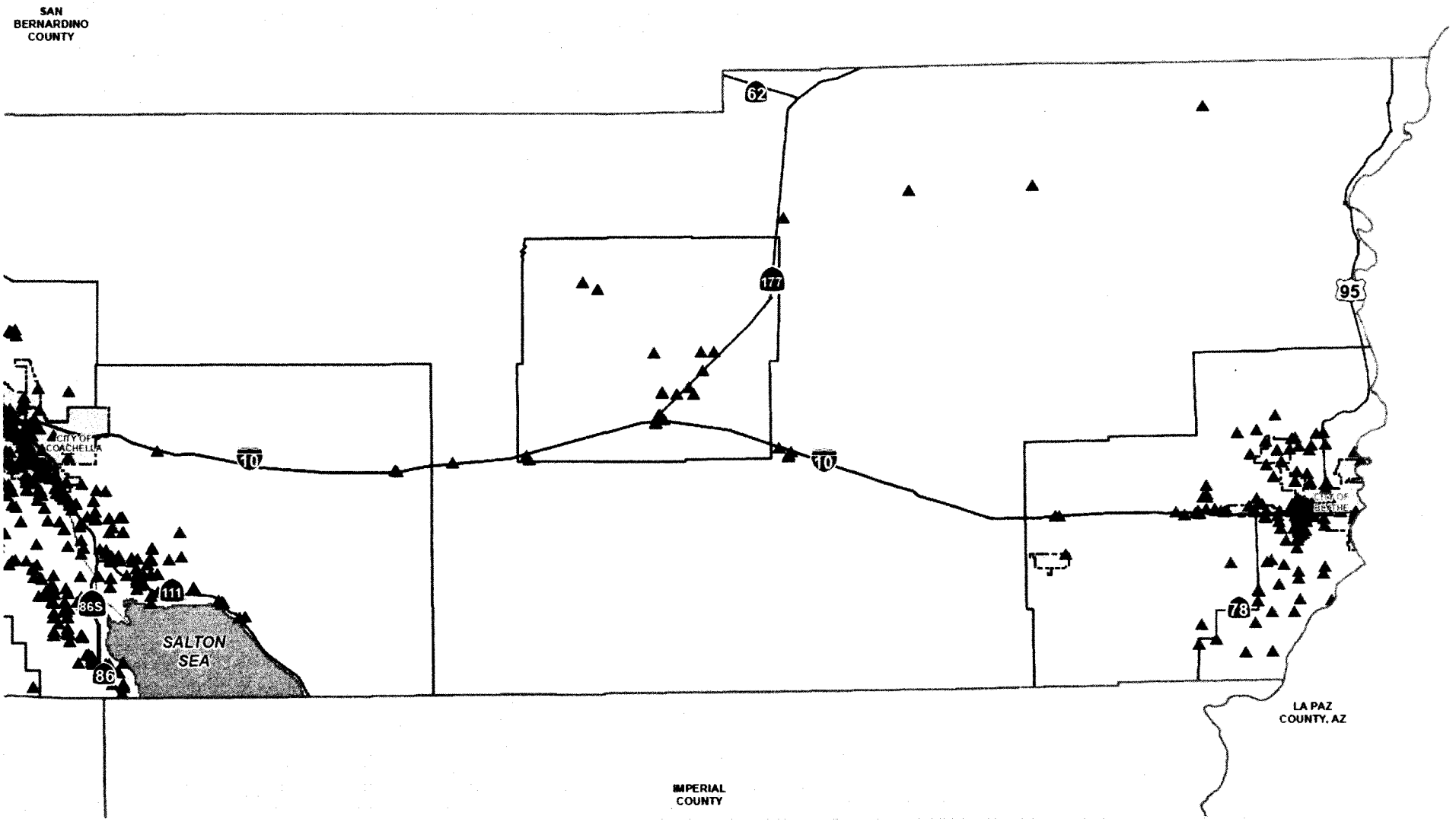
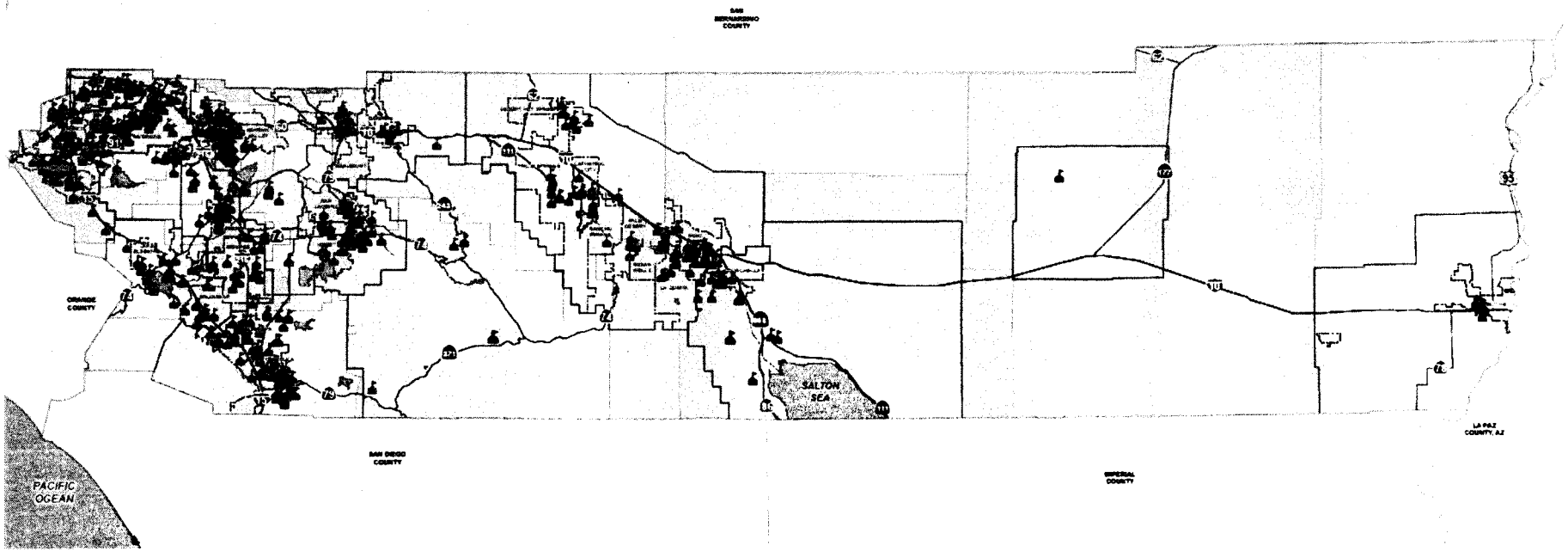
Map 14: Eastern Riverside County Hazardous Materials Locations Map



Map 15: Riverside County School Inventory Map



Data Source: Riverside County (2009)

School Districts

- Alvord Unified
- Banning Unified
- Beaumont Unified
- Coachella Valley Unified
- Colton Joint Unified
- Corona-Norco Unified
- Desert Center Unified
- Desert Sands Unified
- Hemet Unified
- Jurupa Unified
- Lake Elsinore Unified
- Menifee Union & Perris Union High
- Moreno Valley Unified
- Murrieta Valley Unified
- Nuview Union & Perris Union High
- Palm Springs Unified
- Palo Verde Valley Unified
- Perris & Perris Union High
- Riverside Unified
- Romoland & Perrris Union High
- San Jacinto Unified
- Temecula Valley Unified
- Val Verde Unified
- Yucaipa-Calimesa Joint Unified
- School Sites
- Highways
- Area Plan Boundary
- City Boundary
- Waterbodies

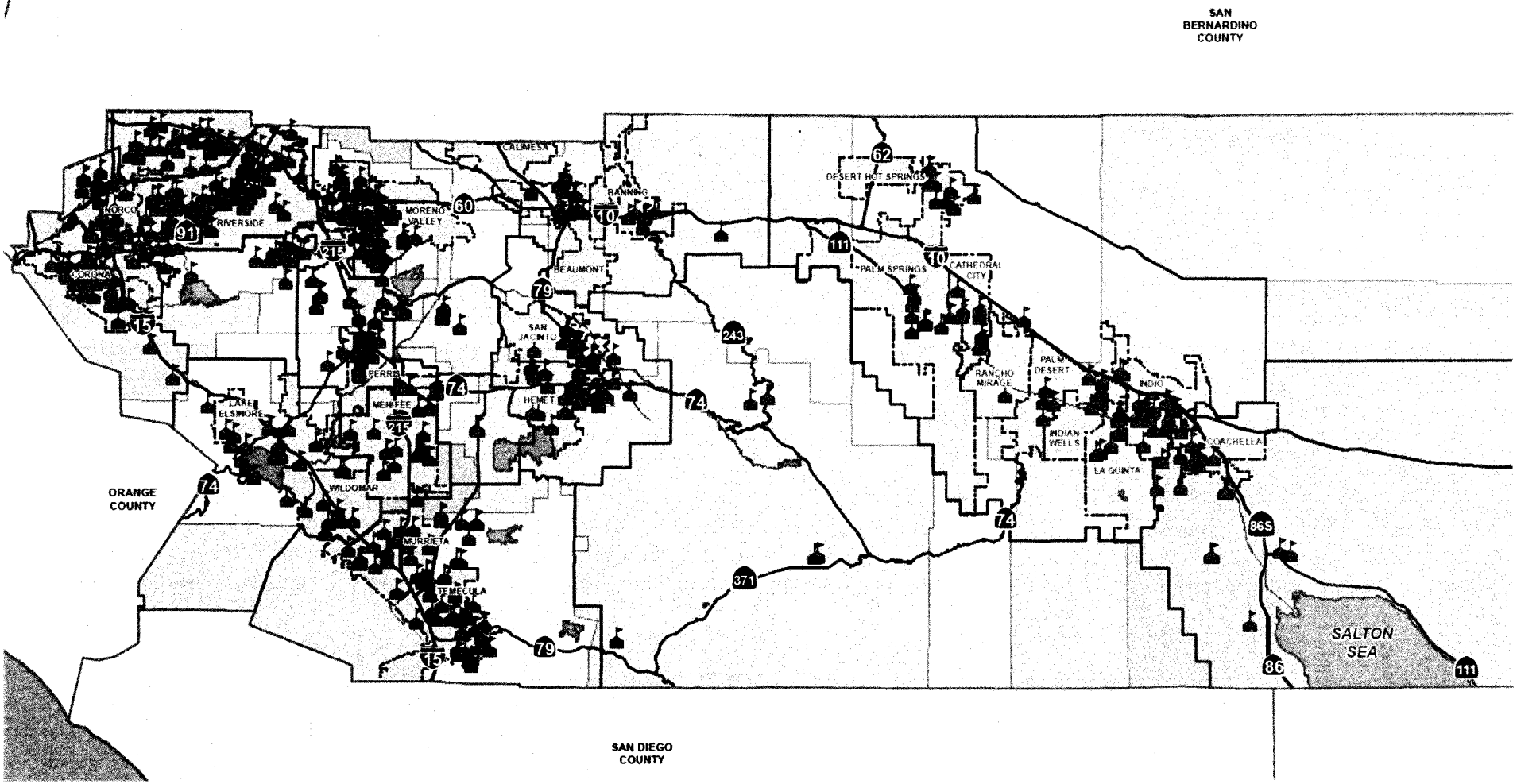
Figure S-15

December 8, 2015

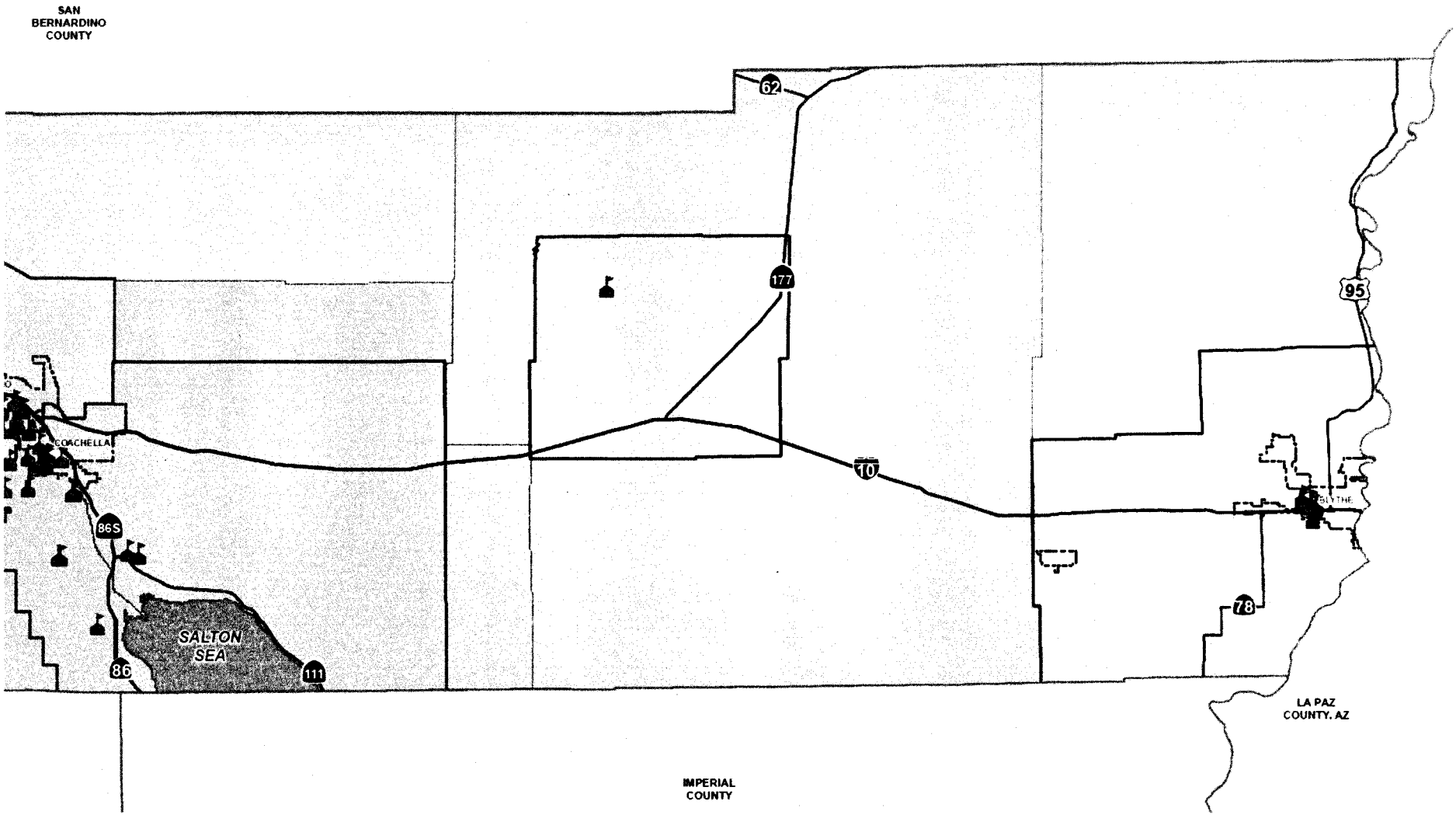
0 10 20 Miles

INVENTORY OF SCHOOL LOCATIONS

Map 16: Western Riverside County School Inventory Map



Map 17: Eastern Riverside County School Inventory Map



4.5 Estimated Property Loss

Table 15: Riverside County Property Values by City

RIVERSIDE COUNTY ASSESSOR
ASSESSED VALUE FOR CITIES
2016/2017

CITY	TOTAL 2016/2017 LOCAL ROLL	LESS NON-REIMBURSED EXEMPTIONS	NET TANGIBLE VALUE	LESS HOMEOWNER'S EXEMPTIONS	2016/2017 NET TAXABLE VALUE	2015/2016 NET TAXABLE VALUE	ASSESSED VALUE CHANGE	PERCENTAGE CHANGE
BANNING	2,045,247,539	45,871,853	1,999,375,686	37,881,836	1,961,493,850	1,882,818,554	78,675,296	4.18%
BEAUMONT	4,033,833,512	72,476,220	3,961,357,292	45,964,609	3,915,392,683	3,643,317,362	272,075,321	7.47%
BLYTHE	761,613,603	63,004,403	698,609,200	10,157,238	688,451,962	650,422,651	38,029,311	5.85%
CALIMESA	777,715,662	23,367,990	754,347,672	11,668,290	742,679,382	688,503,238	54,176,144	7.87%
CANYON LAKE	1,652,995,284	7,904,074	1,645,091,210	15,499,400	1,629,591,810	1,576,999,192	52,592,618	3.33%
CATHEDRAL CITY	4,283,435,909	138,609,909	4,144,826,000	45,685,725	4,099,140,275	3,895,539,688	203,600,587	5.23%
COACHELLA	1,830,946,311	145,800,821	1,685,145,490	20,232,061	1,664,913,429	1,568,941,117	95,972,312	6.12%
CORONA	19,089,817,282	295,245,447	18,794,571,835	137,765,442	18,656,806,393	17,908,062,535	748,743,858	4.18%
DESERT HOT SPRINGS	1,551,338,227	50,664,372	1,500,673,855	18,806,180	1,481,867,675	1,387,764,103	94,103,572	6.78%
EASTVALE	8,480,220,118	24,367,500	8,455,852,618	52,006,677	8,403,845,941	7,985,398,302	418,447,639	5.24%
HEMET	5,462,283,087	160,726,514	5,301,556,573	83,700,458	5,217,856,115	4,910,865,826	306,990,289	6.25%
INDIAN WELLS	5,405,900,297	44,360,931	5,361,539,366	8,750,000	5,352,789,366	5,199,720,372	153,068,994	2.94%
INDIO	7,833,242,426	166,041,389	7,667,201,037	67,986,440	7,599,214,597	7,227,358,677	371,855,920	5.15%
JURUPA VALLEY	8,549,381,868	73,158,280	8,476,223,588	71,144,081	8,405,079,507	7,759,097,935	645,981,572	8.33%
LA QUINTA	12,656,728,074	153,105,942	12,503,622,132	49,049,000	12,454,573,132	11,928,886,312	525,686,820	4.41%
LAKE ELSINORE	5,307,465,580	51,072,923	5,256,392,657	44,361,317	5,212,031,340	4,804,948,961	407,082,379	8.47%
MENIFEE	8,298,729,553	144,682,408	8,154,047,145	104,886,464	8,049,160,681	7,546,039,225	503,121,456	6.67%
MORENO VALLEY	14,312,770,759	265,286,262	14,047,484,497	137,670,247	13,909,814,250	13,082,108,737	827,705,513	6.33%
MURRIETA	12,399,753,873	427,027,712	11,972,726,161	106,791,901	11,865,934,260	11,517,794,187	348,140,073	3.02%
NORCO	3,070,099,530	56,750,389	3,013,349,141	28,081,200	2,985,267,941	2,869,322,737	115,945,204	4.04%
PALM DESERT	14,272,341,711	177,182,717	14,095,158,994	67,417,332	14,027,741,662	13,676,360,170	351,381,492	2.57%
PALM SPRINGS	11,645,678,225	248,294,657	11,397,383,568	60,181,033	11,337,202,535	10,611,925,311	725,277,224	6.83%
PERRIS	5,260,169,698	62,427,955	5,197,741,743	42,537,361	5,155,204,382	4,701,427,764	453,776,618	9.65%
RANCHO MIRAGE	8,800,691,414	547,774,373	8,252,917,041	29,367,800	8,223,549,241	7,902,324,250	321,224,991	4.06%
RIVERSIDE	28,238,701,299	1,258,881,996	26,979,819,303	240,204,427	26,739,614,876	25,457,203,551	1,282,411,325	5.04%
SAN JACINTO	2,686,709,160	53,470,350	2,633,238,810	37,396,030	2,595,842,780	2,450,518,477	145,324,303	5.93%
TEMECULA	14,978,634,970	211,399,196	14,767,235,774	107,238,640	14,659,997,134	13,956,583,981	703,413,153	5.04%
WILDOMAR	3,076,506,781	78,932,764	2,997,574,017	34,419,940	2,963,154,077	2,792,309,928	170,844,149	6.12%
CITY TOTALS	216,762,951,752	5,047,889,347	211,715,062,405	1,716,851,129	209,998,211,276	199,582,563,143	10,415,648,133	5.22%

Table 16: Unincorporated Riverside County Property Values

RIVERSIDE COUNTY ASSESSOR

ASSESSED VALUE FOR UNINCORPORATED AREAS
2016/2017

AREA	TOTAL 2016/2017 LOCAL ROLL	LESS NON-REIMBURSED EXEMPTIONS	NET TANGIBLE VALUE	LESS HOMEOWNER'S EXEMPTIONS	2016/2017 NET TAXABLE VALUE	2015/2016 NET TAXABLE VALUE	ASSESSED VALUE CHANGE	PERCENTAGE CHANGE
Alvord	1,230,054,315	4,293,168	1,225,761,147	13,185,200	1,212,575,947	1,168,289,865	44,286,082	3.79%
Banning	857,212,468	6,125,583	851,086,885	4,479,983	846,606,902	852,236,383	(5,629,481)	-0.66%
Beaumont	648,297,773	15,075,109	633,222,664	10,993,484	622,229,180	586,683,054	35,546,126	6.06%
Coachella	1,671,093,056	80,010,632	1,591,082,424	8,069,138	1,583,013,286	1,510,147,344	72,865,942	4.83%
Colton	116,664,357	2,395,678	114,268,679	1,022,000	113,246,679	109,632,339	3,614,340	3.30%
Corona-Norco	3,875,856,489	25,066,596	3,850,789,893	37,439,128	3,813,350,765	3,662,399,145	150,951,620	4.12%
Desert Center	225,135,919	268,078	224,867,841	286,731	224,581,110	230,368,870	(5,787,760)	-2.51%
Desert Sands	3,278,845,921	24,635,707	3,254,210,214	29,894,896	3,224,315,318	3,160,090,327	64,224,991	2.03%
Elsinore	1,751,940,102	26,941,744	1,724,998,358	20,938,252	1,704,060,106	1,619,779,503	84,280,603	5.20%
Hemet	4,630,913,679	178,713,683	4,452,199,996	60,345,499	4,391,854,497	4,219,200,805	172,653,692	4.09%
Menifee	723,454,268	4,564,864	718,889,404	5,084,800	713,804,604	633,826,810	79,977,794	12.62%
Moreno	675,058,135	6,544,761	668,513,374	1,183,000	667,330,374	667,642,315	(311,941)	-0.05%
Murrieta	2,324,077,841	6,592,272	2,317,485,569	11,002,600	2,306,482,969	2,232,361,878	74,121,091	3.32%
Nuview	748,064,054	5,474,709	742,589,345	9,152,982	733,436,363	684,809,351	48,627,012	7.10%
Palm Springs	2,056,242,569	80,765,934	1,975,476,635	25,297,200	1,950,179,435	1,901,356,909	48,822,526	2.57%
Palo Verde	632,543,996	2,784,631	629,759,365	2,604,106	627,155,259	595,860,635	31,294,624	5.25%
Perris	690,091,152	2,975,783	687,115,369	7,771,056	679,344,313	639,320,863	40,023,450	6.26%
Riverside	3,199,609,739	36,371,239	3,163,238,500	33,399,108	3,129,839,392	2,912,917,501	216,921,891	7.45%
Romoland	477,974,775	4,577,213	473,397,562	9,274,571	464,122,991	429,229,956	34,893,035	8.13%
San Jacinto	253,872,969	124,842,772	129,030,197	1,572,281	127,457,916	122,212,421	5,245,495	4.29%
Temecula	6,526,157,456	97,664,677	6,428,492,779	48,139,000	6,380,353,779	5,988,694,048	391,659,731	6.54%
Val Verde	1,597,610,712	148,031,619	1,449,579,093	14,465,706	1,435,113,387	1,369,550,576	65,562,811	4.79%
Yucaipa	99,434,526	135,778	99,298,748	917,000	98,381,748	94,389,584	3,992,164	4.23%
TOTALS	38,290,206,271	884,852,230	37,405,354,041	356,517,721	37,048,836,320	35,391,000,482	1,657,835,838	4.68%

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Section 5.0 – Risk Assessment

5.1 Overview and Risk Assessment Process

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The Risk is measured by hazard, vulnerability and exposure probability.

The Riverside County Multi-Jurisdiction Hazard Mitigation Plan's risk assessment follows the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses* (FEMA 386-2, 2002), which breaks the assessment down to a four-step process:

- Identify Hazards
- Profile Hazard Events
- Inventory Assets
- Estimate Losses

This risk assessment covers the entire geographical extent of Riverside County, including the incorporated communities and other participating jurisdictions. Since this plan is a multi-jurisdictional plan, participating jurisdictions completed their own hazard analysis and risk assessment and many have ranked their hazards differently than the County to match the needs of their jurisdiction. The County Local Hazard Mitigation Steering Committee has evaluated how these identified hazards and risks vary from jurisdiction to jurisdiction. These individual hazards and assessments are briefly outlined in this chapter with more details found in the jurisdiction's annex. If no additional data is provided in an annex, it should be assumed that the risk and potential impacts to the affected jurisdiction are similar to those described here for the entire Riverside County Operational Area LHMP.

The Riverside County Operational Area LHMP update involved a comprehensive review and update of each section of the risk assessment with new data, where available, and new analyses.

5.1.1 Results and Methodology

The County Local Hazard Mitigation Steering Committee utilized the existing 2012 Local Hazard Mitigation Plan identified hazards. Using existing hazard data and input gained through planning meetings, the Hazard Mitigation Steering Committee agreed upon a list of natural, man-made and technological hazards that could affect Riverside County.

Hazard data from the California Office of Emergency Services (Cal OES), FEMA, and many other sources were examined to assess the significance of these hazards to the planning area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage. The natural hazards evaluated as part of this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future. Man-made and technological hazards were evaluated in the same manner. During the assessment of the identified County hazards the Steering Committee realized the need to add Cyber Attack and Communication Failure to the Local Hazard Mitigation Plan. The Committee based this decision off of the history of events and probability of future occurrences.

Please see table 4.1 Hazard Identification Table for justification of each hazards ranking.

Table 17: 2017 LHMP Top 5 Identified Hazards

Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan Risk Assessment Chart						
Jurisdiction	Priority Risk/ Hazards					Differs from County Priorities?
County	**#1**	**#2**	**#3**	**#4**	**#5**	
Riverside OA	Earthquake	Pan Flu	Wildfire	Electrical Failure	Emergent. Disease	See Section 5.3
Cities						
Banning	Earthquake	Fire	Transportation	HazMat	Flood	Yes
Beaumont	Earthquake	Fire	Flood	HazMat	Transportation	Yes
Blythe	Extreme Weather	Wind	Power Failure	Transportation	HazMat	Yes
Calimesa	Fire	Earthquake	Flood	Extreme Weather	Drought	Yes
Canyon Lake	Flood	Earthquake	Fire	Transportation	Nuclear Incident	Yes
Cathedral City	Earthquake	Flood	Wind	Landslide	Extreme Weather	Yes

Coachella	Earthquake	Extreme Weather	HazMat	Power Failure	Wind	Yes
Corona	Earthquake	Fire	Power Failure	Terrorism	Flood	Yes
Desert Hot Springs	Earthquake	Flood	Fire	Extreme Weather	Wind	Yes
Eastvale	Earth	Flood	Fire	Pipeline	Insect Infestation	Yes
Hemet	Earthquake	Pan Flu	Fire	Electrical Failure	Emergent Disease	No
Indian Wells	Earthquake	Flood	Extreme Weather	Power Failure	Wind	Yes
Indio	Earthquake	Extreme Weather	Emergent Disease	Pan Flu	Drought	Yes
Jurupa Valley	Earthquake	Pan Flu	Fire	Power Failure	Emergency Disease	No
La Quinta	Earthquake	Flood	Power Failure	Extreme Weather	Drought	Yes
Lake Elsinore	Fire	Flood	Power Failure	Extreme Weather	Drought	Yes
Murrieta	Earthquake	Pan Flu	Fire	Power Failure	Emergent Disease	No
Norco	Flood	Fire	Earthquake	Extreme Weather	Agricultural Hazard	Yes
Palm Desert	Earthquake	Flood	Extreme Weather	Power Failure	Drought	Yes
Palm Springs	Earthquake	Power Failure	Transportation	Extreme Weather	Wind	Yes

Perris	Fire	Flood	Earthquake	HazMat	Power Failure	Yes
Rancho Mirage	Earthquake	Flood	Fire	Drought	Civil Unrest	Yes
Riverside	Earthquake	Flood	Drought	Terrorism	Fire	Yes
San Jacinto	Earthquake	Extreme Weather	Flood	Landslide	Drought	Yes
Temecula	Transportation	Earthquake	Flood	Terrorism	Fire	Yes
Wildomar	Earthquake	Fire	Drought	Flood	Extreme Weather	Yes
Tribes						
Morongo	Wildfire	Severe Wind Event	Earthquake	Electrical Failure	Transportation	Yes
Special Districts						
Eastern Municipal Water	N/A	N/A	N/A	N/A	N/A	See Annex
High Valleys Water	Extreme Weather	Drought	Fire	Wind	Power Failure	Yes
Idyllwild Fire Protection	Fire	Drought	Insect Infestation	Earthquake	Pan Flu	Yes
Imperial Irrigation District	Earthquake	Extreme Weather	Terrorism	N/A	N/A	Yes
Kaiser	Earthquake	Fire	Extreme Weather	Drought	Wind	Yes

Rancho California Water	Earthquake	Drought	Flood	Fire	N/A	Yes
Santa Ana Watershed	Earthquake	Wind	N/A	N/A	N/A	Yes
Western Municipal Water	Pipeline	Power	Extreme Weather	Drought	Wind	Yes
School Districts						
Beaumont Unified	Earthquake	Wind	Drought	Fire	Flood	Yes
Desert Sands Unified	Earthquake	Flood	Extreme Weather	HazMat	Drought	Yes
Hemet Unified	Civil Disorder	Extreme Weather	Wind	Flood	Fire	Yes
Lake Elsinore Unified	Earthquake	Pan Flu	Extreme Weather	Flood	Nuclear	Yes
Moreno Valley Unified	Earthquake	Fire	Extreme Weather	Power Failure	Wind	Yes
Perris Union High School	Earthquake	Fire	Wind	Pan Flu	Flood	Yes
Riverside Community College	Insect Infestation	Jail/Prison Event	Civil Disorder	Nuclear	Terrorism	Yes
Riverside County Office of Education	Earthquake	Wildland Fire	Pandemic	Flood	Severe Wind	Yes
Riverside Unified	Earthquake	Power Failure	Pipeline	HazMat	Extreme Weather	Yes
San Jacinto Unified	Earthquake	Fire	Flood	Wind	Extreme Weather	Yes

Please refer to individual annexes for additional hazard priorities for participating jurisdictions.

5.2 Agency Inventory Description

All participants were asked to evaluate the potential for an event to occur in their jurisdiction by hazard and the potential impact based on:

1. Economic loss and recovery
2. Physical loss of structures (residential, commercial, and critical facilities)
3. Infrastructure loss or damage
4. Continuity of operations for a normal daily governmental activities
5. Ability to quickly recover from the event and return to normal daily activities
6. Loss of life and potential injuries from the event.

The participants were then asked to rate the potential and severity using a scale of between 0 and 4 (4 being the most severe). The jurisdictions were also asked to rank the listed hazards as they relate to their jurisdiction from 1 to 20 (1 being the highest overall threat to their jurisdiction).

The following table was given to participants during the 2012 plan update and again for the 2017 update. Participants were informed that the county hazards were likely to be re-ranked and Communication Failure and Cyber-attack would be added.

Figure 27: 2012 and 2017 Participant Ranking Chart

NAME:	AGENCY:	DATE :

	COUNTY		LOCAL JURISDICTION		
HAZARD	**SEVERITY 0 - 4**	**PROBABILITY 0 - 4**	**SEVERITY 0 - 4**	**PROBABILITY 0 - 4**	**RANKING 1 - 20**
1. EARTHQUAKE					
2. WILDLAND FIRE					
3. FLOOD					
OTHER NATURAL HAZARDS					
4. DROUGHT					
5. LANDSLIDES					
6. INSECT INFESTATION					
7. EXTREME SUMMER/WINTER WEATHER					
8. SEVERE WIND EVENT					
AGRICULTURAL					
9. DISEASE/CONTAMINATION					
10. TERRORISM					
OTHER MAN-MADE					
11. PIPELINE					
12. AQUEDUCT					
13. TRANSPORTATION					
14. POWER OUTAGE					
15. HAZMAT ACCIDENTS					
16. NUCLEAR ACCIDENT					
17. TERRORISM					
18. CIVIL UNREST					
19. JAIL/PRISON EVENT					
MEDICAL					
20. PANDEMIC					

Note: Please refer to the individual Local Hazard Mitigation Plans for participating jurisdiction

Please See Appendix E for the Inventory Worksheet template provided to participants.

The County Ranking used a similar format when looking at the probability and severity of a potential hazard but also included information on Healthcare Impact and Mitigation Capabilities. The following chart was used by the Local Hazard Mitigation Steering Committee while ranking the 2017 Hazards.

Figure 28: 2017 County Hazard Ranking and Risk Scores

HAZARD	PROBABILITY	SEVERITY	HEALTHCARE	EMS	BEHAVIORAL / MENTAL HEALTH	RESPONDER AGENCIES	COMMUNITY AGENCIES	*RISK SCORE*
	Improbable: 0 Remote: 1 Occasional: 2 Probable: 3 Frequent: 4	NA: 0 Negligible: 1 Marginal: 2 Critical: 3 Catastrophic: 4	NA: 0 Negligible: 1 Marginal: 2 Critical: 3 Catastrophic: 4	NA: 0 Negligible: 1 Marginal: 2 Critical: 3 Catastrophic: 4	NA: 0 Negligible: 1 Marginal: 2 Critical: 3 Catastrophic: 4	NA: 0 Low: 1 Moderate: 2 High: 3 Extreme: 4	NA: 0 Low: 1 Moderate: 2 High: 3 Extreme: 4	
Aqueduct	2	3	2	2	2	2	3	**0.38**
Drought	3	3	2	2	2	2	2	**1.13**
Earthquake	2	4	4	4	3	2	2	**3.50**
Extreme Weather	2	3	2	2	2	2	2	**0.75**
Flood	3	3	2	3	2	2	3	**1.13**
Insect Infestation	3	2	2	1	1	2	2	**0.00**
Landslide	3	3	1	1	1	2	2	**-0.56**
Tornado	1	2	2	2	2	2	2	**0.25**
Wildland Fire	4	3	3	3	3	3	3	**2.25**
Civil Disorder	2	3	3	3	1	4	0	**1.13**
Communications Failure	2	3	3	3	3	3	3	**1.13**
Cyber Attack	4	2	3	2	2	3	1	**1.50**
Dam Failure	1	3	2	3	2	2	3	**0.38**
Electrical Failure	4	4	2	2	2	2	2	**2.00**
HazMat Incident	4	3	2	2	1	3	3	**-0.75**
Jail/Prison Event	1	2	1	1	1	4	0	**-0.13**
Nuclear/Radiological Incident	1	4	2	3	3	2	2	**1.00**
Pipeline Disruption	2	3	2	2	1	3	3	**-0.38**
Terrorist Event - MCI	1	3	3	3	4	3	1	**1.13**
Transportation Failure	2	3	2	2	1	2	2	**0.38**
Water Supply Disruption/Contamination	3	2	0	0	0	2	2	**-1.50**
Emergent Disease/Contamination	3	3	3	3	2	3	2	**1.69**
Pandemic Flu	2	4	4	4	4	3	2	**3.50**

5.3 Hazard Profiles and Descriptions

Hazard Assessment and Identification

The County utilized the tools described in Section 3.3 for the hazard identification process and provided them to the individual cities and special districts. Cal OES MyPlan was used for information about floods, earthquake, fire and some critical facilities locations. Additionally, Riverside County Transportation and Land Management Agency provided maps detailing where hazards and critical facilities are located.

All participating jurisdictions and special districts conducted a risk assessment and identified hazards specific to their jurisdiction, document the impact of those hazards, and develop specific goals and strategies to address the risks and hazards.

The probability of each hazard in Riverside County was determined by rating their occurrence level from 0 - 4, in which each level or number represented a specific descriptor. For example, improbable = (0), remote = (1), occasional = (2), probable = (3), and frequent = (4). Each descriptor was defined according to how often each hazard occurs in Riverside County.

- *Improbable* means it is not likely to happen in more than ten years
- *Remote* means it happens once in ten years
- *Occasional* means it happens once in five years
- *Probable* means it happens once every two years (biannual)
- *Frequent* means it happens at least once a year (annually)

Identification of Hazards

With its varying topography; a mix of urban and rural areas and rapidly growing permanent, transient, and recreational populations, the Riverside County Operational Area is subject to potential negative impacts from a broad range of hazards and threats. There are three broad categories of hazards that threaten the OA:

- Natural hazards
- Technological hazards
- Man-Made hazards

5.3.1 Earthquake

Severity: 4

Probability: 2

Risk Score: 3.50

OA Jurisdictions Affected by Earthquakes

- All incorporated cities of Riverside County
- Unincorporated areas of Riverside County

Hazard Definition

An earthquake is a sudden, rapid shaking of the ground caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of plates.

Where earthquakes have struck before, they can strike again, often without warning. The major form of direct damage from most earthquakes is damage to construction. Bridges are particularly vulnerable to collapse and dam failure may generate major downstream flooding. Buildings vary in susceptibility depending on their construction and the types of soils on which they are built. Earthquakes destroy utility infrastructure which, in turn, may set off fires, hinder rescue efforts, and impact normal functions for an extended period of time. The hazard of earthquakes varies from place to place depending on the regional and local geology. Ground shaking may occur 65 miles or more from the epicenter (the point on the ground surface above the focus). Ground shaking can change the mechanical properties of some fine grained, saturated soils, where upon the soils liquefy and act as a fluid (liquefaction).

Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects as a result of the ground shaking.

Figure 29: Historical Earthquakes in the Riverside County Area - 5.0 and Above

Year	Richter Scale Magnitude	Description
1812	7.0	Occurred on the southern section of the San Andreas fault near Wrightwood.
1857	7.9	Occurred 60 miles northwest of Fort Tejon and ruptured 225 miles of the San Andreas fault.
1890	6.5	Occurred in the "San Jacinto or Elsinore Fault region" on the Rockhorse Truck Trail, north of the Borrego Valley Airport.
1890	6.5	Occurred in the same region as the 1890 earthquake.
1899	6.4	San Jacinto earthquake destroys San Jacinto and Hemet
1910	5.0	Occurred on the Elsinore fault northwest of the City of Lake Elsinore.
1918	6.9	San Jacinto earthquake strikes the same area that was damaged by an earthquake 19 years earlier.
1923	6.3	North San Jacinto Fault earthquake damaged the San Bernardino and Redlands area. This the last known time that this fault, which runs under the I-215/I-10 interchange, ruptured in this area.
1937	6.0	Terwilliger Valley earthquake was in the same general area as the 1890 earthquake.
1942	6.3	Fish Creek Mountains earthquake was south of the Ocotillo airport.
1954	6.2	Arroyo Salada earthquake was west of the Salton Sea.
1968	6.5	Borrego Mountain Earthquake was northeast of Ocotillo Wells
1987	6.6	Superstition Hills earthquake near the Salton Sea
1992	7.2	Occurred near Landers, California and caused the rupture of five different faults. Those faults were: Johnson Valley, Landers, Homestead Valley, Emerson, and Camp Rock.
1992	7.3	Occurred 3 hours after the Landers Earthquake with an epicenter near Big Bear, CA
1994	6.8	Northridge Earthquake
1999	7.4	Hector Mine Earthquake
2010	5.4	Borrego Springs earthquake believed by seismologists to have been possibly triggered by the strong earthquake which occurred near Calexico in 2010.

Located within Riverside County are several known active and potentially active earthquake faults, including the San Andreas Fault, San Jacinto Fault, and Elsinore Fault In the event of an earthquake, the location of the epicenter, as well as the time of day and season of the year, would have a profound effect on the number of deaths and casualties, as well as property damage.

Research centers devoted to the detection and logging of earthquake events record the ongoing weekly activity of small magnitude in Riverside County faults. The most recent earthquake in Riverside County was located in Banning on July 7, 2017, and had a magnitude of 1.1. There are a number of small scale earthquakes that happen weekly but larger scale or catastrophe shaking is less likely.

A **moderate** earthquake occurring in or near Riverside County could result in deaths, casualties, property damage, environmental damage, and disruption of normal government and community services. The effects could be aggravated by collateral emergencies such as fires, flooding, hazardous material spills, utility disruptions, landslides, transportation emergencies, and the possible failure of several dams in Riverside County. The community needs would most likely exceed the response capability of the County's emergency management organizations, requiring mutual assistance from volunteer and private agencies, the California Office of Emergency Services (Cal OES), and the Federal Emergency Support Functions.

A **catastrophic** earthquake in Riverside County could cause thousands of casualties, extensive major property damage, disruption in communications and utility systems, disruption in supply and distribution systems, and general panic. An earthquake of this magnitude could directly affect all of Riverside County and most of southern California, causing a critical demand on mutual aid resources and competition for national relief.

Key effects and response considerations:

- **Effects on people and housing.** In any earthquake, the primary consideration is saving lives. Time and effort must also be dedicated to providing for mental health for reuniting families, providing shelter to displaced persons, and restoring basic needs and services. Major efforts will be required to remove debris and clear roadways, demolish unsafe structures, assist in re-establishing public services and utilities, and provide continuing care and temporary housing for affected citizens.

  A survey of local, State, and Federal government emergency plans indicate that although there is a general capacity to respond to small and intermediate-sized earthquakes, it is unlikely that any of these governmental units will be able to cope with the immediate impact of a great quake, such as a Magnitude (M) 8.3 event on the south-central San Andreas fault. The general public must realize that the assistance that they have been used to expecting simply will not be immediately available. In fact, in the event of an earthquake of such magnitude, citizens must be prepared to wait for up to 72 hours or more for any type of organized response.

- **Effects on commercial and industrial structures.** After any earthquake, individuals are likely to lose wages due to the inability of businesses to function because of damaged goods and/or facilities. With business losses, the County of Riverside and the cities in the Riverside County Operational Area will lose revenue. Economic recovery from even a minor earthquake will be critical to the communities involved.

- **Effects on infrastructure.** The damage caused by an earthquake can lead to the paralysis of the local infrastructure: police, fire, medical and governmental services.

- **Effects on Critical Facilities.** A large number of critical facilities have been identified as being adjacent to the various faults in the County and surrounding counties. The list of facilities includes hospitals, fire stations, law enforcement facilities, and schools.

  Effects on agriculture. Earthquakes can cause loss of human life, loss of animal life, and property damage to structures and land dedicated to agricultural uses. The most significant long-term impacts on agriculture from earthquakes are those that arise from the cascading effects of fire and flood.

Note: Please refer to Section 4.4 Critical Facilities for additional maps.

Historically, the San Andreas Fault is the most active among the fault network that cuts through rocks of the California coastal region. The entire San Andreas Fault system is more than 800 miles long and extends to depths of at least 10 miles within the earth. The San Andreas Fault in California forms a continuous, narrow break in the earth's crust that extends from northern California southward to Cajon Pass near San Bernardino; southeastward from Cajon Pass. Several branching faults, including the San Jacinto and Banning faults, share the movement of the crustal plates as the fault continues to the south east, on to the Salton Sea and on to Baja California Sea of Cortez.

Recent studies of the eastern section of the San Andreas near San Gorgonio Pass reveal that this area is more advanced in the cycle of strain accumulation than the western area at the Cajon Pass. Earthquake activity around the Southern San Andreas, including the June 1992 Landers-Big Bear earthquakes, has prompted scientists to increase their studies of this area.

The San Jacinto fault has had a higher level of moderate-to- large earthquakes during the past 50 to 100 years, although the rate of slip is not as high. Geodetic data indicates there is an "appreciable" strain accumulation across both faults, implying that either one

or both may be primed for release. One of the larger and more active fault segments of the San Jacinto fault, the Casa Loma Faults, runs from near Perris Reservoir to just north of Anza. Also, another large and active named segment is the Clark Fault, which runs from near Hemet to just 9 miles southwest of the shore of the Salton Sea. Historically, this section of the San Jacinto Fault produced a series of large earthquakes starting in 1899 on average every 14 years with the longest interval being 19 years. The last slip occurred on the Superstition Hills and Elmore Ranch sequence in1987. In 2015, the Working Group on California Earthquake Probabilities (WGCEP) estimated 30-year probabilities of 19 percent for an M 6.7 and larger event on the Southern San Jacinto Fault.

A third major fault zone that traverses Riverside County is the Elsinore Fault. The Elsinore Fault Zone is one of the largest in southern California. The main trace of the Elsinore fault zone has only seen one historical event greater than magnitude 5.2 – the earthquake of 1910, a magnitude 6 shock near Temescal Valley.

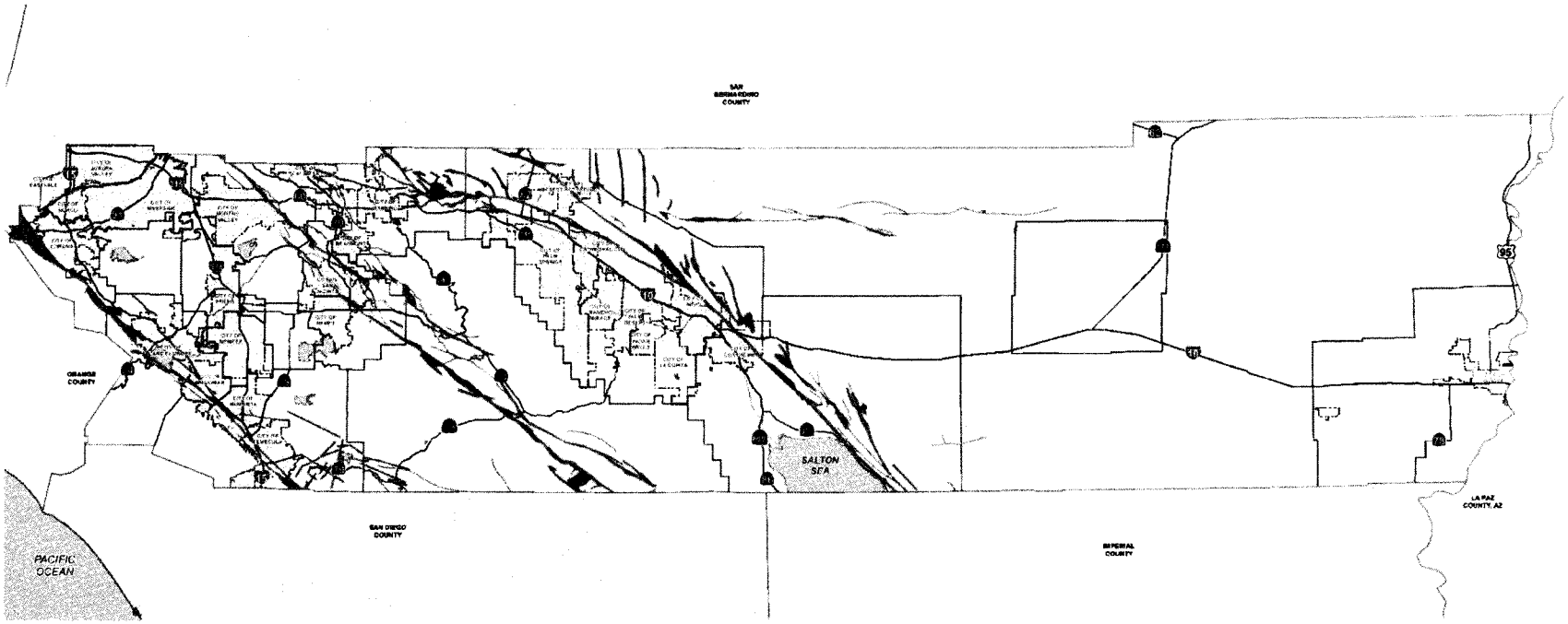
Risk Assessment Conclusion.

Riverside County is at risk for a significant earthquake causing catastrophic damage and strains on response and mitigation resources. Both property and human life are at high risk. The County experiences hundreds of minor quakes and tremblers each month from the myriad of faults in the area. Studies indicate that stress is building up in major faults like the San Andreas. A major quake could happen at any time.

Earthquake risk is very high in the most heavily populated western portion of the County and the Coachella Valley, due to the presence of two of California's most active faults, the San Andreas and San Jacinto. The risk is moderate in the eastern portion of the County beyond the Coachella Valley.

The following maps have been provided by the Riverside County Transportation and Land Management Agency and developed using Cal OES MyPlan.

Map 18: Riverside County Faults and Zones



Data Source: Riverside County Geology (2013)/California Geological Survey (2008)

Fault Zones

- Alquist-Priolo
- Riverside County
- Highways
- Area Plan Boundary
- City Boundary
- Waterbodies

Figure S-2

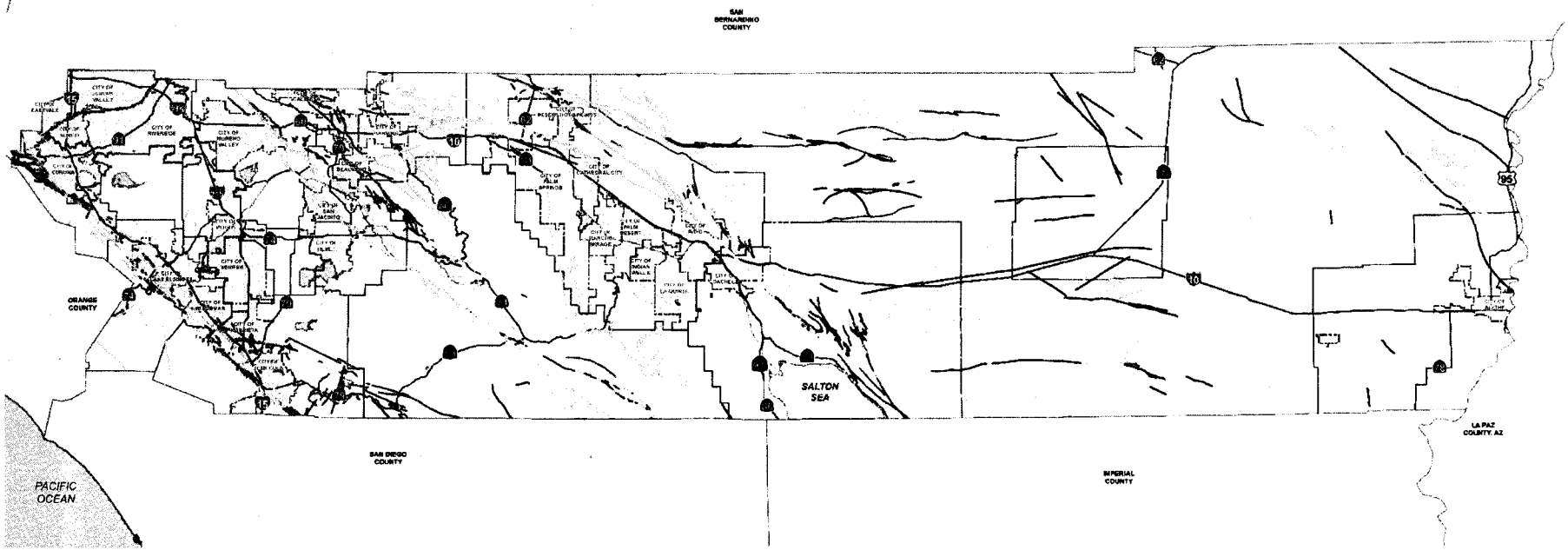
December 8, 2015

Miles: 0 10 20

Disclaimer: Maps and data are to be used for reference purposes only. Map features are approximate, and are not necessarily accurate to surveying or engineering standards. The County of Riverside makes no warranty or guarantee as to the content (the source is often third party), accuracy, timeliness, or completeness of any of the data provided, and assumes no legal responsibility for the information contained on this map. Any use of this product with respect to accuracy and precision shall be the sole responsibility of the user.

EARTHQUAKE FAULT STUDY ZONES

Map 19: Fault Activity

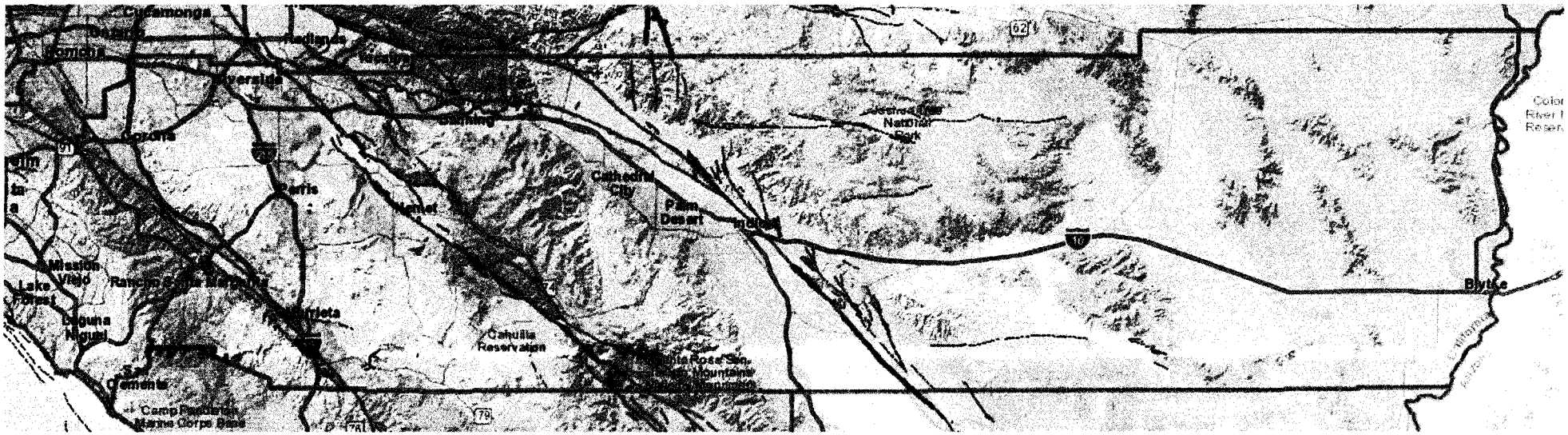


Data Source:County Geology (2013)/California Geological Survey (2008)

Figure S-1

MAPPED FAULTING IN RIVERSIDE COUNTY

Map 20: Ground Shaking Potential



Relationship to Other Hazards – Cascading Effects

Earthquakes can cause many cascading effects such as fires, flooding, hazardous material spills, utility disruptions, landslides, transportation emergencies, electrical failure and the possible failure of several dams in Riverside County.

Hazus Assessment

HAZUS®MH was used to generate general building stock and essential facility loss estimates for five different natural hazard scenarios. Two of the scenarios were large scenario earthquakes. The earthquakes chosen for analysis were an M6.8 Elsinore Fault Scenario Earthquake, and the M7.8 "ShakeOut" Scenario Earthquake on the Southern San Andreas Fault.

Risk assessment results were generated using the following HAZUS®MH analysis options:

- **General Buildings**
  - Ground Motion
  - Damage State Probabilities
  - Damage
  - Direct Economic Loss
- **Essential Facilities**
  - Medical Care
  - Police Stations
  - Fire Stations
  - Emergency Response
  - Schools
- **Transportation Systems**
  - Highways
  - Railways
  - Light Rail
  - Bus System
  - Port and Harbor
  - Ferry System
  - Airport Transportation
- **Utility Systems**
  - Potable Water
  - Waste Water
  - Oil
  - Natural Gas

- Electric Power
- Communication

- **Induced Physical Damage**
  - Fire following
  - Debris
- **Direct Social Losses**
  - Casualties
  - Shelter

Table 18 (ES-2) provides a summary of HAZUS®MH-estimated regional impacts for Riverside County for the two earthquake scenarios. As shown in the tables, the total estimated direct economic loss related to building damage ranges from $1.8B to $9.8B in the two scenario events. It should be noted that these totals are for Riverside County only. Both earthquake scenarios have the potential to cause additional damage in adjacent counties (for example, the Elsinore scenario would also significantly impact San Diego and Orange counties), whose losses are not tabulated here.

Table 18: Summary of HAZUS estimated Impacts on Riverside County for Two Earthquake Scenarios

Table ES-2. Summary of HAZUS®MH-estimated Impacts on Riverside County for Two Earthquake Scenarios

Impact Category	M6.8Elsinore	M7.8"ShakeOut" San Andreas*
Economic Loss due to Building Damage	$1.2B	$6.9 B
Total Building-related Direct Economic Loss	$1.8B	$9.8 B
# Buildings in Complete Damage State	100	25,000* (many MH)
Debris Generated (million tons)	0.3	3.5
Displaced Households	110 Households	19,000 Households*
People Needing Short-term Shelter	90 People	8,600 People*
Fatalities (2 am, 2 pm, 5 pm)	<10,<10,<10	60 bldg (70 all causes)*
Total Injuries (2 am, 2 pm, 5 pm)	200, 200, 220	11,600 bldg (11,900 all)*
% of Households without Water	<1%	99%
# Highway Bridges w/ at least Moderate Damage (potentially closed)	None expected	100

*Note: selected custom estimates for the "ShakeOut" scenario have been taken from the full USGS technical report, "*The ShakeOut Scenario*": http://pubs.usgs.gov/of/2008/1150

Table 19 summarizes expected essential facility performance in the two earthquake events. Estimated building damages to essential facilities in Riverside County ranges from about $64M - $351M. These loss totals should not be considered all-inclusive, as replacement cost data was not available for many hospitals, and a small number of schools and police facilities.

Table 19: Summary of HAZUS – estimated Impacts for Riverside County Essential Facilities in Two Earthquake Scenarios

Essential Facility	Category	M6.8 Elsinore		M7.8 "ShakeOut" San Andreas	
		Mean Damage	Economic Loss ($1,000)	Mean Damage	Economic Loss ($1,000)
Hospitals*	Medium	2%	$4,858	14%	$3,842
	Large	0%	$899	26%	$5,180
Schools	K-12 (default data)	1%	$2,375	2%	$3,708
	K-12 (providing data)	1%	$54,774	6%	$314,182
	CCD (providing data)	0%	$706	5%	$24,465
EOCs		1%	$3	6%	$20
Police Stations		0%	$3	7%	$35
Fire Stations		1%	$3	4%	$14
TOTALS			**$63,620**		**$351,446**

*Note: In Riverside County, there are no hospitals which would be categorized by HAZUS as "Small" (<50 licensed acute care beds)

Elsinore Earthquake Scenario – Regional Impacts

The M6.8 Elsinore scenario earthquake will impact the western-most communities and infrastructure of Riverside County. A summary of regional impacts is provided in Figure 29. These impacts are described below.

Of the approximately 647,000 buildings modeled within the improved general building stock data for Riverside County, less than 1% (approximately 100) are expected to suffer "complete" damage in the Elsinore scenario earthquake. These buildings would be considered "red-tagged" or unsafe for continued occupancy. A small percentage of these buildings (15% or less) have the potential for collapse, suggesting the need for Urban

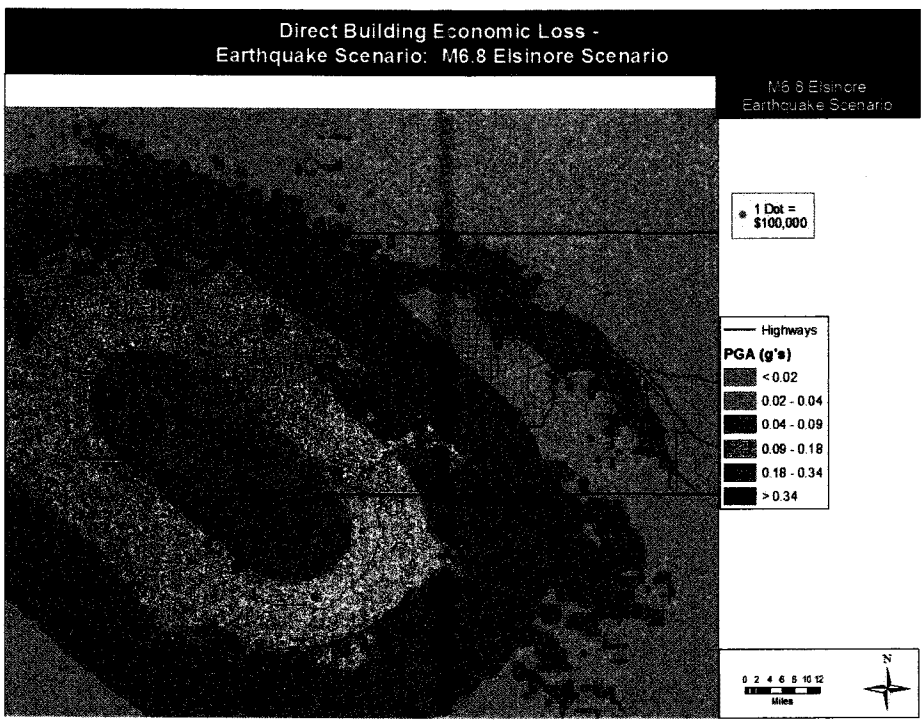
Search & Rescue (USAR). Approximately 2,200 buildings (0.3%) are expected to suffer "extensive" damage, and would be considered "yellow-tagged", with restrictions on continued use. While the remainder of buildings would be considered "green-tagged" (safe for occupancy, although some damage may have occurred), as many as 3% (20,500) would be expected to suffer "moderate" damage, and an additional 13% (82,700) would suffer "slight" damage.

As much as 0.3 million tons of debris may result from these damaged buildings – 47% is expected to be heavy debris (concrete and steel), requiring heavy equipment to break down and remove, while 53% is expected to be light debris (wood, brick and other debris).

The number of people killed as a result of shaking-induced and transportation system damage is expected to be less than 10, regardless of the time of day that the earthquake occurs.

Total injuries, including the range of injuries from minor injuries treated with basic medical care to mortal injuries (deaths), are expected to be on the order of 200-220. Transportation of the injured for treatment is not expected to be impacted by transportation system damage, as no bridge in the County is expected to suffer "moderate" damage or greater.

Figure 30: Direct Building Economic Loss



"ShakeOut" San Andreas Earthquake Scenario Regional Impacts

The M7.8 "ShakeOut" San Andreas scenario earthquake will impact most of the populated portions of Riverside County. A summary of impacts is provided in Table 19. It should be noted, however, that some impact estimates have been taken from the improved estimates developed by the extensive community modeling effort (Jones, et al., 2008) conducted for the "ShakeOut" exercise. The use of these estimates is noted where appropriate.

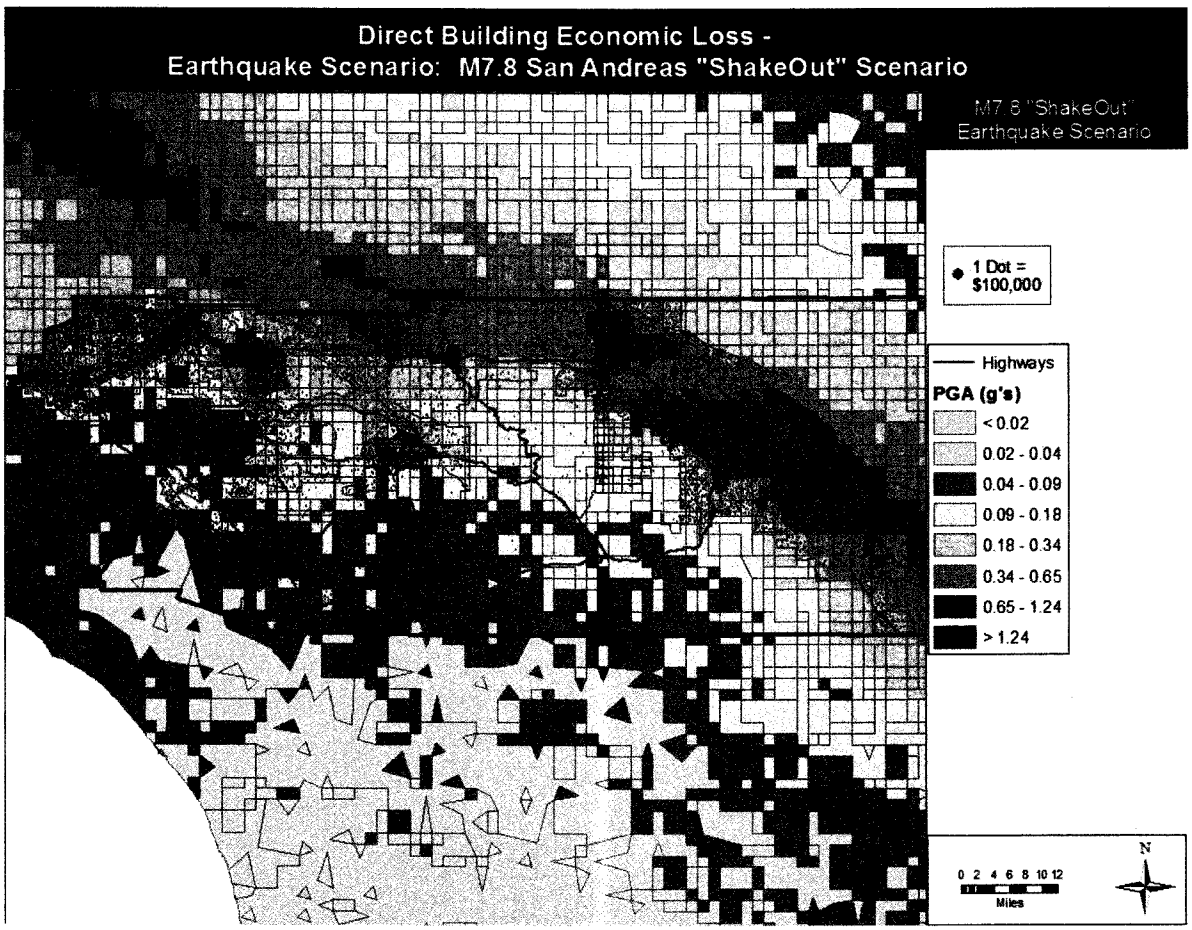
Table 20: Summary of HAZUS – Estimated Impacts for Riverside County Due to an M7.8 Scenario Earthquake on the "ShakeOut" San Andreas Fault

Economic Loss due to Building Damage Total Building-related Direct Economic Loss	$6.9 B $9.8 B
# Buildings in Complete Damage State	25,000* (many MH)
Debris Generated (million tons)	3.5
Displaced Households People Needing Short-term Shelter	19,000 Households* 8,600 People*
Fatalities (2 am, 2 pm, 5 pm) Total Injuries (2 am, 2 pm, 5 pm)	60 in buildings (70 all causes)* 11,600 in buildings (11,900 all)*
% of Households without Water	99%
# Highway Bridges w/ at least Moderate Damage (potentially closed)	100

*Note: selected custom estimates for the "ShakeOut" scenario have been taken from: http://pubs.usgs.gov/of/2008/1150

In the M7.8 "ShakeOut" Scenario earthquake on the San Andreas Fault, dollar losses related to shaking-induced building damage are estimated to reach $6.9 billion, while total direct economic losses are expected to be approximately $9.8 billion. The geographic distribution of total direct economic loss is mapped in Figure 4-9.

Figure 31: Direct Economic Loss in Riverside County Resulting from an M7.8 Scenario Earthquake on the "ShakeOut" San Andreas Fault



According to the published "ShakeOut" scenario (Jones, et al., 2008), approximately 25,000 buildings would be expected to suffer "Complete" damage in the scenario earthquake. These building, predominantly residential mobile homes, would be considered "red-tagged" or unsafe for continued occupancy. A small percentage of these buildings (15% or less) have the potential for collapse, suggesting the need for Urban Search & Rescue. More than 18,000 buildings are expected to suffer "Extensive" damage in this scenario earthquake and would be considered "yellow-tagged", with restrictions on continued use. While the remainder of buildings would be considered "green-tagged" (safe for occupancy, although some damage may have occurred), approximately 63,000 would be expected to suffer "Moderate" damage, and an additional 137,000 would suffer "Slight" damage.

Almost 3.5 million tons of debris may result from these damaged buildings – 58% is expected to be heavy debris (concrete and steel), requiring heavy equipment to break down and remove, while 42% is expected to be light debris (wood, brick and other debris).

In the "ShakeOut" scenario (Jones, et al., 2008), damage to single family and multi-family dwellings is expected to result in the displacement of approximately 19,000 households. Immediately after the earthquake, significant disruption to the water supply and distribution system is expected, essentially impacting the entire county. While many of the displaced may find shelter with friends and family, or in available hotels, approximately 8,600 people are expected to seek public shelter.

The number of people killed as a result of shaking-induced building, transportation system damage, and post-earthquake fire may be on the order of 60 to 70 people. Total injuries, including the range of injuries from minor injuries treated with basic medical care to mortal injuries (deaths) from all causes, are estimated to reach 11,900 within the County.

Transportation of the injured for treatment could be impacted by transportation system damage with as many as 100 bridges in the County suffering at least "Moderate" damage.

Essential Facility Impacts

Table 19 provides an overview of essential facility performance in the "ShakeOut" San Andreas Scenario earthquake. The table lists the number of essential facility sites and buildings (these numbers will differ for multi-building campuses, such as schools and hospitals). The table also provides the total building replacement value and the number of buildings for which value data was available. As can be seen in the table, replacement cost data for hospitals was generally not available, unlike most other essential facility types. Expected building performance in this earthquake event is on the order of 7% damage or less for EOCs, fire stations, police stations, and schools, but as much as 26% damage for large hospitals. The total economic loss for essential facilities has been estimated to exceed $351 million, with 97% of the total loss occurring in schools. It should be noted that although cost data is only available for 31 hospital buildings (out of 77), these 31 buildings suffer more than $9 million in loss, indicating that the actual total economic loss for hospitals would be significant, but can't be estimated at this time because of the lack of replacement value data.

Table 21: Riverside County Essential Facility Loss Estimates – M7.8 "ShakeOut" San Andreas Fault Scenario Earthquake

Essential Facility	Category	No. of Facilities/ Sites	No. of Buildings	No. of Beds	Replacement Cost ($1,000)	# Buildings w/ replacement cost data	Functionality Day 1 (%)	Mean Damage	Economic Loss ($1,000)
Hospitals*	Medium	8	28	793	$162,827	21	64	14%	$3,842
	Large	8	49	2,467	$200,792	10	26	26%	$5,180
Schools	K-12 (default data)	152	152		$219,600	152	74	2%	$3,708
	K-12 (providing data)	689	9,981		$6,049,534	9,213	64	6%	$314,182
	CCD (providing data)	12	258		$356,708	257	54	5%	$24,465
EOCs		43	43		$310,273	43	60	6%	$20
Police Stations		51	51		$675,299	48	57	7%	$35
Fire Stations		156	156		$366,493	156	72	4%	$14
TOTALS		**1,119**	**10,718**	**3,260**	**$8,341,525**	**9,900**			**$351,446**

*Note: In Riverside County, there are no hospitals which would be categorized by HAZUS as "Small" (<50 licensed acute care beds)

The following three maps are from the Fault Activity Map of California, California Geologic Survey, Data Map

Map 21: Fault Activity Map of California, Western Riverside County

Explanation

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain.

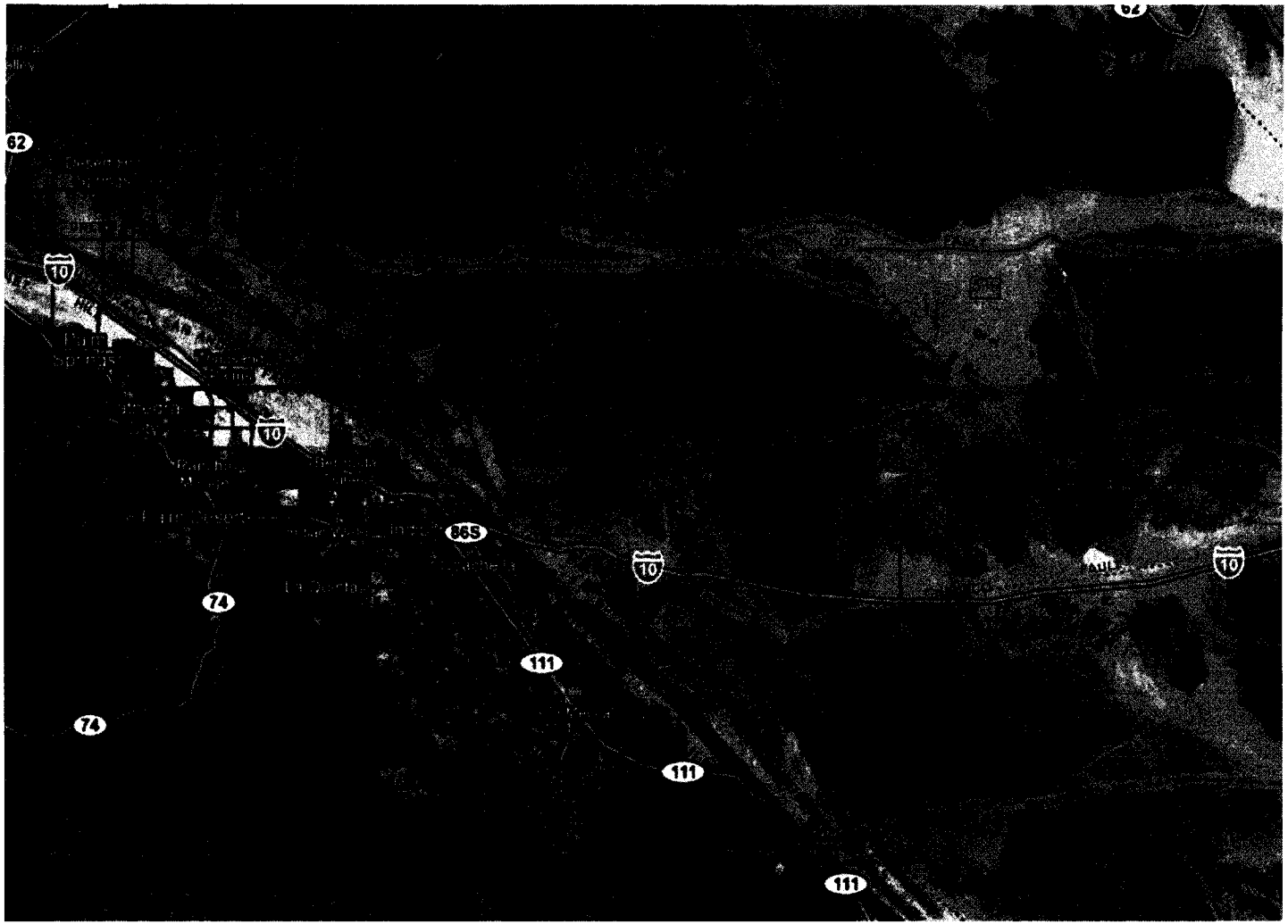
FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

1. Fault along which historic (last 200 years) displacement has occurred
2. Holocene fault displacement (during past 11,700 years) without historic record
3. Late Quaternary fault displacement (during past 700,000 years)
4. Quaternary fault (age undifferentiated)
5. Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement

ADDITIONAL FAULT SYMBOLS

6. Bar and ball on downthrown side (relative or apparent)
7. Arrows along fault indicate relative or apparent direction of lateral movement
8. Arrow on fault indicates direction of dip
9. Low angle fault (barbs on upper plate)

Map 22: Fault Activity Map of California, Central Riverside County



Explanation

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain.

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Quaternary fault (age undifferentiated)

Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement

ADDITIONAL FAULT SYMBOLS

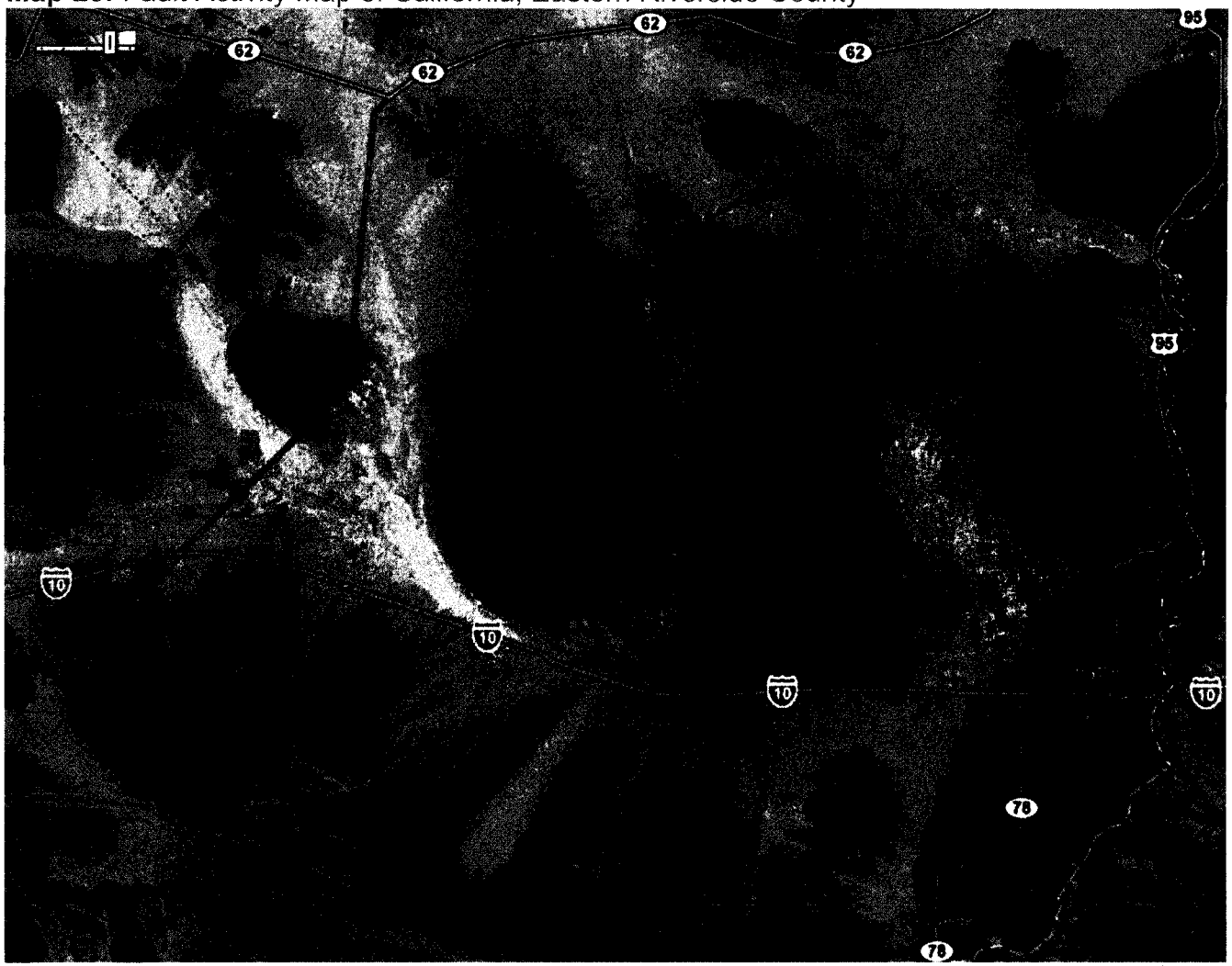
Bar and ball on downthrown side (relative or apparent)

Arrows along fault indicate relative or apparent direction of lateral movement

Arrow on fault indicates direction of dip

Low angle fault (barbs on upper plate)

Map 23: Fault Activity Map of California, Eastern Riverside County



5.3.2 Pandemic Flu

Severity: 4

Probability: 2

Risk Score: 3.50

OA Jurisdictions Affected by Pandemic and Epidemic

- All incorporated cities of Riverside County
- Unincorporated areas of Riverside County

Hazard Definition

A disease outbreak can cause illness and result in significant casualties. Since 1900, there have been four influenza pandemics that killed approximately 600,000 people in the United States. In 2009 the H1N1 flu was first identified in Imperial and San Diego counties, killing more than 550 Californians, sent thousands more to hospitals, caused widespread fear and anxiety and the declaration of a public health emergency. H1N1 in 2009 tested the State's medical infrastructure as never before. H1N1 quickly spread nationwide and then around the globe, taking a heavy toll on people not usually susceptible to serious influenza.

History

2009 - Rise of H1N1, popularly referred to as the Swine Flu. According to the California Center for Infectious Diseases, the H1N1 flu (2009 H1N1 influenza virus) is a type of influenza virus that causes respiratory disease that can spread between people. While most people who have been sick have recovered without needing medical treatment, hospitalizations and deaths from infection with this virus has occurred. The spread of H1N1 flu occurs in the same way that seasonal flu spreads. Flu viruses are spread mainly from person to person through coughing or sneezing by people with influenza. As a result of preparation and mitigation strategies such as vaccinations and public education, the threat of a full-blown H1N1 pandemic in the U.S. is receding. However, the possibility of another pandemic still exists.

2003 - A previous pandemic flu threat that still looms is the avian flu. Birds can contract avian flu and pass it along to humans. Some strains of the avian flu are more virulent than others. Public health experts continue to be alert to the risk of a possible re-emergence of a 2003 epidemic of avian flu among people primarily in Asia. People who had been very close contact with infected birds (for example, people who lived with chickens in their houses) contracted a virulent form of avian

flu and there was a significant death rate from this disease. Thus far, the avian flu virus has not mutated and has not demonstrated easy transmission from person to person. However, were the virus to mutate in a highly virulent form and become easily transmissible from person to person, the public health community would be very concerned about the potential for a pandemic influenza outbreak. Such a pandemic could disrupt all aspects of society and severely affect the economy.

Risk Assessment

Influenza, also known as the flu, is a disease that attacks the respiratory system (nose, throat, and lungs) in humans. Although mild cases may be similar to a viral "cold," influenza is typically much more severe. It usually comes on suddenly; may include fever, headache, tiredness, dry cough, sore throat, nasal congestion, and body aches; and more often results in complications such as pneumonia. Seasonal influenza is a yearly occurrence that causes serious flu-related complications primarily for persons aged 65 and older and those with chronic health conditions (such as asthma, diabetes, or heart disease), pregnant women, and young children. Those who are exposed but do not succumb develop immunity to the strain circulating that year. Worldwide pandemics of influenza occur when a novel virus emerges to which the population has little immunity. The 20th century saw three such pandemics, the most notable of which was the 1918 Spanish influenza pandemic that was responsible for 20 million deaths throughout the world. Secondary impacts include significant economic disruption that can occur due to loss of employee work time and costs of treating or preventing spread of the flu.

Source: https://archive.cdph.ca.gov/HealthInfo/discond/Pages/Influenza(Flu).aspx

California Department of Public Health

The 2009 H1N1 influenza (flu) pandemic occurred against a backdrop of pandemic response planning at all levels of government including years of developing, refining and regularly exercising response plans at the international, federal, state, local, and community levels. At the time, experts believed that avian influenza A (H5N1) viruses posed the greatest pandemic threat. H5N1 viruses were endemic in poultry in parts of the world and were infecting people sporadically, often with deadly results. Given that reality, pandemic preparedness efforts were largely based on a scenario of severe human illness caused by an H5N1 virus. Despite differences in planning scenarios and the actual 2009 H1N1 pandemic, many of the systems established through pandemic planning were used and useful for the 2009 H1N1 pandemic response.

http://www.cdc.gov/h1n1flu/cdcresponse.htm (see attachment for complete document report)

The California Department of Public Health (CDPH) monitors flu conditions on an annual bases, including all virologic, case based and syndromic surveillance. CDPH works with Riverside County to help the community prepare and mitigate the effects of Pandemic Flu.

- **Effects on people and housing.** The risk to people can be severe, leading to hospitalization and possibly loss of life. Damage to housing as a result of Pandemic Flu is not likely.

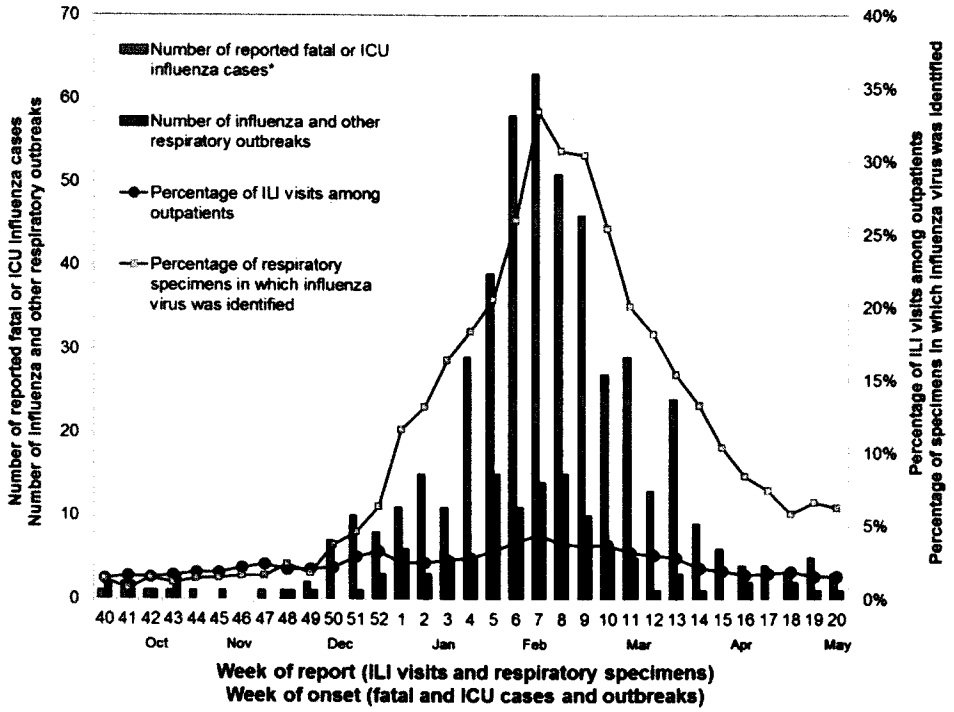
- **Effects on commercial and industrial structures**. The risks are minimal to structures.

- **Effects on infrastructure.** The risks are minimal, but if there is a pandemic the risk will decrease the numbers of workers that go to work, which can have economic and functional effects to the organizations in a community. Continuity of Business and Continuity of Government planning goes into action in these cases.

- **Effects on agriculture.** The risk of animals borne disease can be great in a pandemic, depending on the disease. The impact to agriculture can be great, again depending on the disease.

The following charts are from the CDPH Influenza and Other Respiratory Diseases

Figure 32: Surveillance Report for the 2015–2016 Flu Season.



October 4, 2015–October 1, 2016

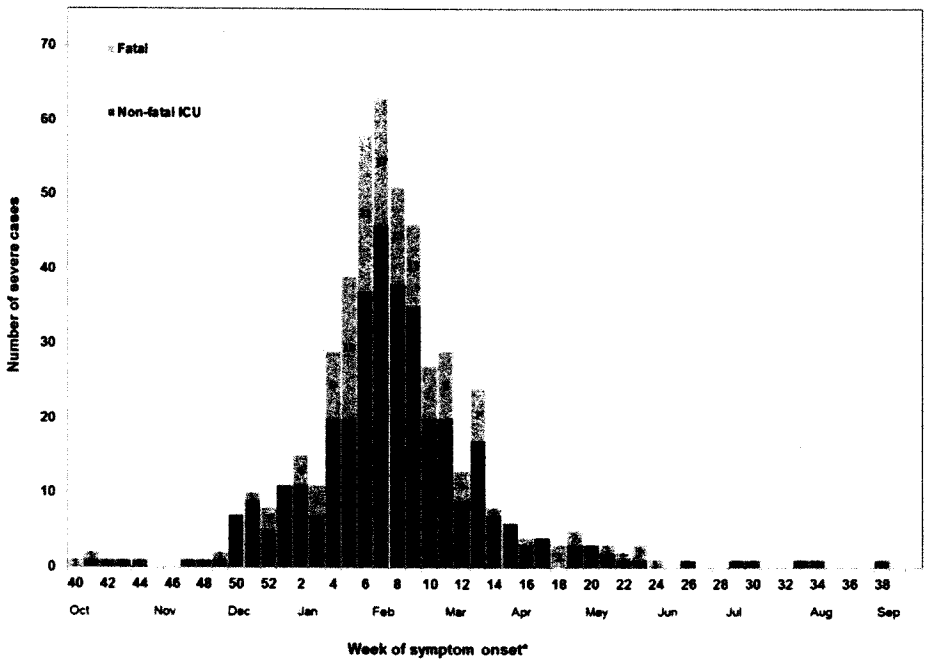


Table 22: Statewide 2011-2016 Influenza Cases0

Appendix I. Number of fatal and non-fatal ICU cases of laboratory-confirmed influenza in persons <65 years of age reported to the California Department of Public Health, by local health jurisdiction, 2011–2012 influenza season through 2015–2016 influenza season

	2011-2012*		2012-2013*		2013-2014*		2014-2015*		2015-2016*	
Jurisdiction	Fatal	Non-fatal ICU	Fatal	Non-fatal ICU	Fatal	Non-fatal ICU	Fatal	Non-fatal ICU	Fatal	Non-fatal ICU
CALIFORNIA	51	166	116	241	416	837	79	290	144	355
Alameda†	6	9	3	3	12	26	2	12	5	19
Berkeley City	0	0	0	0	0	1	0	0	0	1
Alpine	0	0	0	0	0	0	0	0	0	0
Amador	0	0	0	0	0	3	0	1	0	1
Butte	0	2	0	1	3	3	0	0	0	1
Calaveras	0	0	0	0	2	2	0	0	0	0
Colusa	0	0	0	0	0	1	0	0	0	0
Contra Costa	0	9	1	12	9	40	1	8	1	11
Del Norte	0	0	1	0	0	0	0	0	0	0
El Dorado	0	0	0	0	3	8	0	1	0	3
Fresno	3	10	7	14	22	18	4	14	5	8
Glenn	0	0	0	0	1	1	0	0	0	0
Humboldt	0	0	0	3	1	6	1	1	1	1
Imperial	0	0	0	0	2	6	0	0	0	1
Inyo	0	0	0	0	0	0	0	0	0	1
Kern	1	2	2	0	11	23	0	5	1	1
Kings	0	0	0	0	7	5	0	2	1	2
Lake	0	2	0	0	1	5	0	3	0	1
Lassen	0	0	0	0	1	1	0	0	0	0
Los Angeles†	12	0	32	0	75	22	16	7	36	0
Long Beach City	1	2	1	0	8	4	1	5	1	10
Pasadena City	0	0	0	0	0	0	0	0	0	0
Madera	0	0	2	1	3	6	1	1	1	1
Marin	0	0	0	1	2	1	0	2	0	0
Mariposa	0	0	0	0	0	0	0	1	0	0
Mendocino	0	1	0	1	4	12	0	0	0	1
Merced	0	1	0	0	5	6	0	0	0	1
Modoc	0	0	0	0	0	0	0	0	0	0
Mono	0	0	0	0	0	0	0	0	0	0
Monterey	0	1	0	4	7	12	2	6	1	2
Napa	0	0	0	0	0	7	1	1	0	3
Nevada	1	0	0	0	1	4	0	2	0	0
Orange	2	18	6	31	22	35	11	23	14	40
Placer	0	0	0	2	1	9	1	3	1	3
Plumas	0	0	0	0	0	0	0	1	0	0
Riverside	0	16	6	14	23	43	2	14	9	22
Sacramento	3	25	10	40	29	96	4	27	8	42
San Benito	0	0	0	1	0	0	0	0	0	1
San Bernardino	5	15	7	13	31	52	4	15	6	32
San Diego	5	10	17	43	44	112	8	59	28	64
San Francisco	0	1	2	1	4	28	1	0	0	0
San Joaquin	2	5	0	8	8	23	3	8	2	9
San Luis Obispo	0	0	2	2	1	7	0	3	0	3
San Mateo	2	10	1	3	6	18	5	12	2	6
Santa Barbara	0	2	1	4	3	9	2	6	4	10
Santa Clara	1	8	9	10	20	45	2	14	6	17
Santa Cruz	0	1	0	4	5	6	0	6	0	4
Shasta	0	0	0	0	3	10	0	1	0	5
Sierra	0	0	0	0	0	0	0	0	0	0
Siskiyou	0	0	0	0	2	5	0	0	0	0
Solano	0	1	0	7	3	14	2	10	2	6
Sonoma	0	0	0	1	7	19	1	2	5	4
Stanislaus	2	6	1	3	13	31	2	2	1	2
Sutter	0	0	0	1	1	3	0	0	0	0
Tehama	0	0	1	2	0	2	0	0	0	1
Trinity	0	0	0	0	0	0	1	0	0	0
Tulare	1	1	1	2	5	25	0	2	0	3
Tuolumne	0	0	0	0	1	1	0	0	0	0
Ventura	4	7	3	6	3	11	1	9	3	7
Yolo	0	1	0	3	1	10	0	1	0	4
Yuba	0	0	0	0	0	0	0	0	0	1

* 2011–2012: October 2, 2011–September 29, 2012; 2012–2013: September 30, 2012–September 28, 2013; 2013–2014: September 29, 2013–September 27, 2014; 2014-2015: September 28, 2014-October 3, 2015; 2015-2016: October 4, 2015-October 2, 2016

† Does not include city counts

Source:Https://archive.cdph.ca.gov/HealthInfo/discond/Documents/CA%20Year%20End%20Flu%20Summary_2015-2016_final.pdf

5.3.3 Wildland Fire

Severity: 3

Probability: 4

Risk Score: 2.25

OA Jurisdictions Affected by Wildfire

- Fern Valley Water District
- Idyllwild Fire Protection District
- Idyllwild Water District
- Menifee Union School District
- Temecula Valley Unified School District
- Riverside County Office of Education
- Riverside Unified School District
- San Jacinto Unified School District

Cities in which CAL FIRE has made recommendations on Very High Fire Hazard Severity Zones (VHFHSZ) in Riverside County (22 cities)

- Banning
- Beaumont
- Calimesa
- Canyon Lake
- Cathedral City
- Corona
- Desert Hot Springs
- Hemet
- Jurupa Valley
- Lake Elsinore
- Menifee
- Moreno Valley
- Murrieta
- Norco
- Palm Desert
- Palm Springs
- Perris
- Rancho Mirage
- Riverside
- San Jacinto
- Temecula
- Wildomar

Map 24: Riverside County Wildland Fire Threat

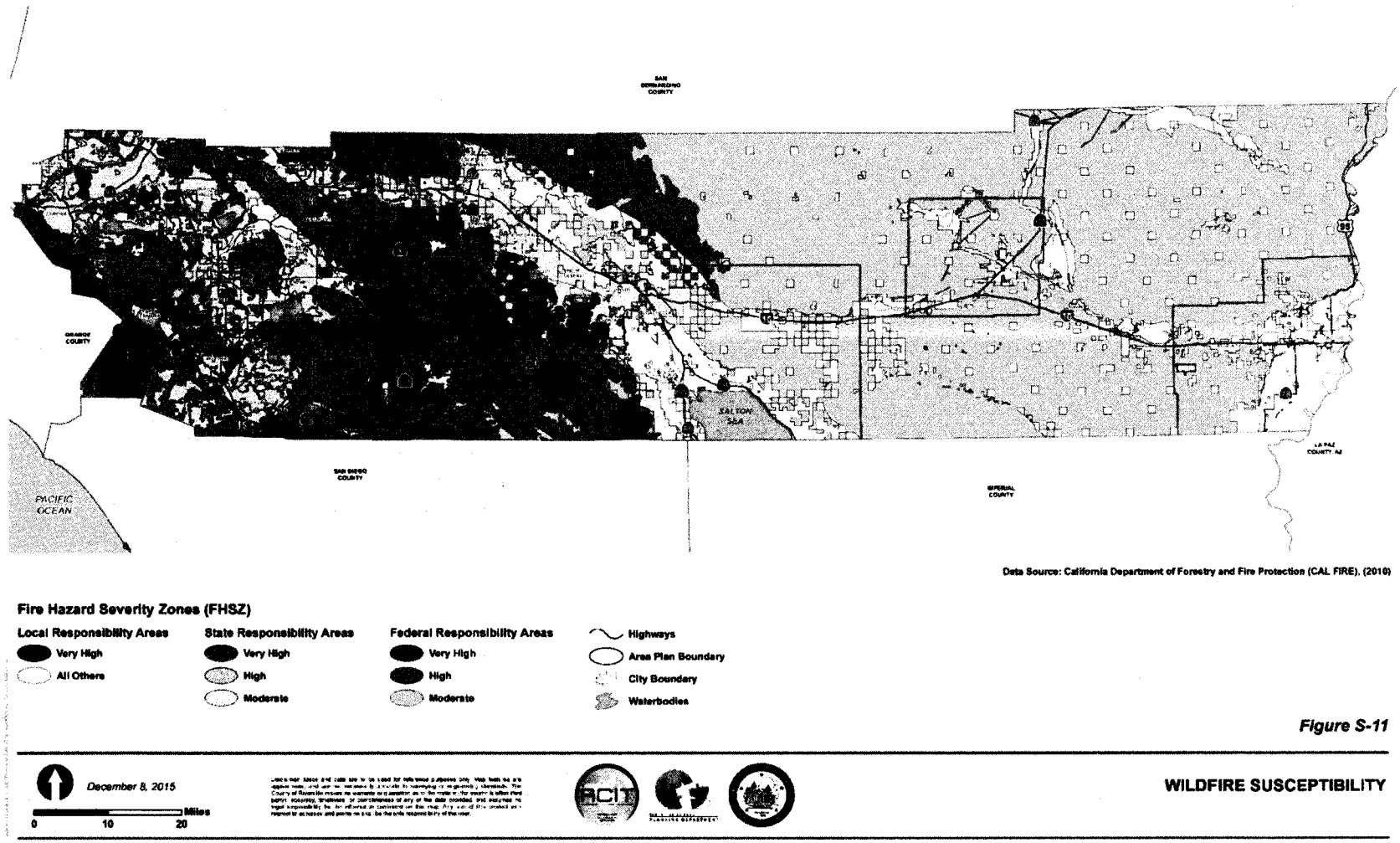


Figure S-11

WILDFIRE SUSCEPTIBILITY

Hazard Definition

A wildfire is an uncontrolled fire spreading through vegetative fuels, posing danger and destruction to property. Wildfires can occur in undeveloped areas and spread to urban areas.

Public Resources Code §4114 and §4130 authorize the State Board of Forestry and Fire Protection (Board) to establish a fire plan which, among other things, establishes the levels of statewide fire protection services for State Responsibility Area (SRA) lands. These levels of service recognize other fire protection resources at the federal and local level that collectively provide a regional and statewide emergency response capability. In addition, California's integrated mutual aid fire protection system provides fire protection services through automatic and mutual aid agreements for fire incidents across all ownerships where structures and other human development are more concentrated.

The California Fire Plan is the state's road map for reducing the risk of wildfire. The Fire Plan is a cooperative effort between the State Board of Forestry and Fire Protection and the California Department of Forestry and Fire Protection. By placing the emphasis on what needs to be done long before a fire starts, the Fire Plan looks to reduce firefighting costs and property losses, increase firefighter safety, and to contribute to ecosystem health.

State Responsibility Areas (SRAs)

State Responsibility Areas (SRAs) are those lands within California that meet specific geographic and environmental criteria. These are areas where CAL FIRE has legal and financial responsibility for wildland fire protection and where CAL FIRE administers fire hazard classifications and building standard regulations. SRAs are defined as lands that 1) are county unincorporated areas, 2) are not federally owned, 3) have wildland vegetation cover rather than agricultural or ornamental plants, 4) have watershed and/or range/forage value, and 5) have housing densities not exceeding three units per acre.60 Similar to the Federal Responsibility Areas (FRAs), where SRAs contain built environment or development, the responsibility for fire protection of those improvements (non-wildland) is that of a local government agency.

Local Responsibility Areas (LRAs)

Local Responsibility Areas (LRAs) include land within incorporated cities, cultivated agriculture lands and non-flammable areas in unincorporated areas and those lands that do not meet the criteria for SRA or FRA. LRA fire protection is typically provided by city fire departments, fire protection districts, and counties, and by CAL FIRE under contract

to local governments. LRAs may include flammable vegetation and Wildland-Urban Interface (WUI) areas where the financial and jurisdictional responsibility for improvement and wildland fire protection is that of a local government agency.

Homes in Wildland-Urban Interface (WUI) Areas

Wildfire poses a significant risk to the people of California and their homes, as evidenced by an increasing trend in structural losses from wildland fires. The risk is predominantly associated with wildland-urban interface (WUI) areas. WUI is a general term that applies to development interspersed within or adjacent to landscapes that support wildland fire.

Housing Unit Density Classes:

Class Description

- Rural/Outlying: From one housing unit per five acres to one housing unit per twenty acres.
- Urban: Dwelling unit density of 2 to 8 units per acre.
- Wildland Urban Interface: The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.
- Wildland Intermix Interface is a condition where homes and other structures are scattered throughout a wildland area.

Managing the human/wildfire conflict requires a commitment of resources and a focused mitigation plan over the long term. The approach must be system-wide and include the following:

- An informed, educated public that takes responsibility for its own decisions relating to wildfire protection
- An effective wildfire suppression program
- An aggressive hazardous fuels management program

- Land use policies and standards that protect life, property, and natural resources
- Building and fire codes that reduce structural ignitions from windblown embers and flame contact from WUI fires and impede or halt fire spread within the structure once ignited
- Construction and property standards that provide defensible space

While some wildfires start by natural causes, humans cause four out of every five wildfires. Wildfires started by humans are usually the result of debris burns, arson, or carelessness. As a natural hazard, a wildfire is often the direct result of a lightning strike that may destroy personal property and public land areas, especially on state and national forest lands. The predominate dangers from wildfires are:

1. Injury or loss of life to people living in the affected area or using the area for recreational facilities.
2. Injury or loss of life to first responders.
3. The destruction of timber, property, wildlife

History

There is a long history of wildfires in Riverside County. The table below represents Wildland Fires of 100 acres or greater from 2001 to 2017. The source of the information is the California Department of Forestry and Fire Protection.

Table 23: Riverside County Large Fires 300 Acres and Greater (2001-2017)

Wildland Incidents within Riverside to include Local and State Incidents.

YEAR	NUMBER OF LARGE FIRES
2017	6 (as of July 2017)
2016	3
2015	5
2014	1
2013	5
2012	7
2011	1
2010	4
2009	3
2008	3
2007	6
2006	12
2005	7
2004	6
2003	9
2002	5
2001	5

Source: http://cdfdata.fire.ca.gov/incidents/incidents_search_results?search=riverside

Interestingly, the preceding Riverside County Wildland Fire Threat map points out the distinct bi-lateral character of Riverside County. The western end of the County is more

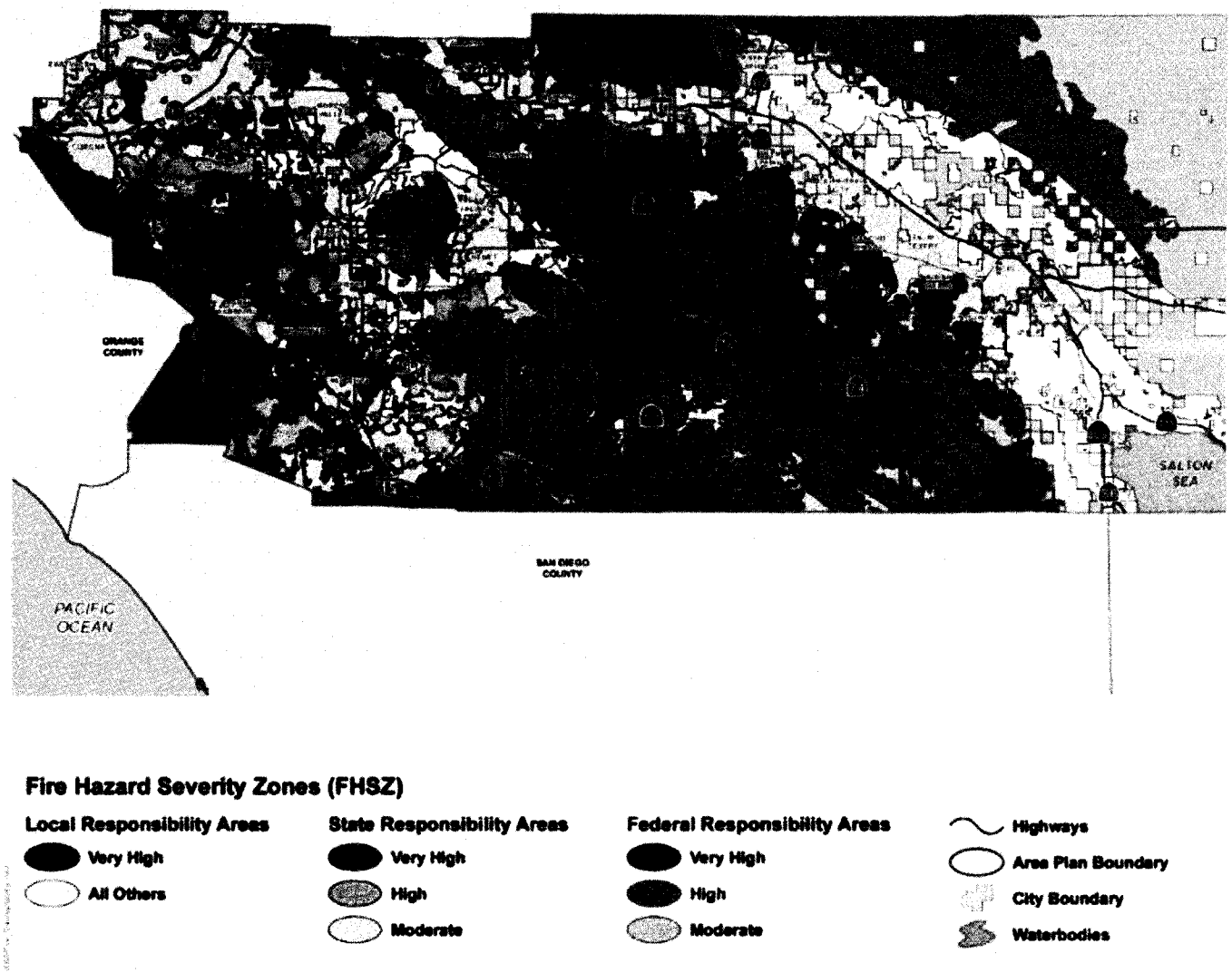
urban, densely populated, and covered with vegetation that is susceptible to wildfires. The eastern end of the County is primarily desert, with far less population and far less vegetation than the western end of the County.

The categories are:

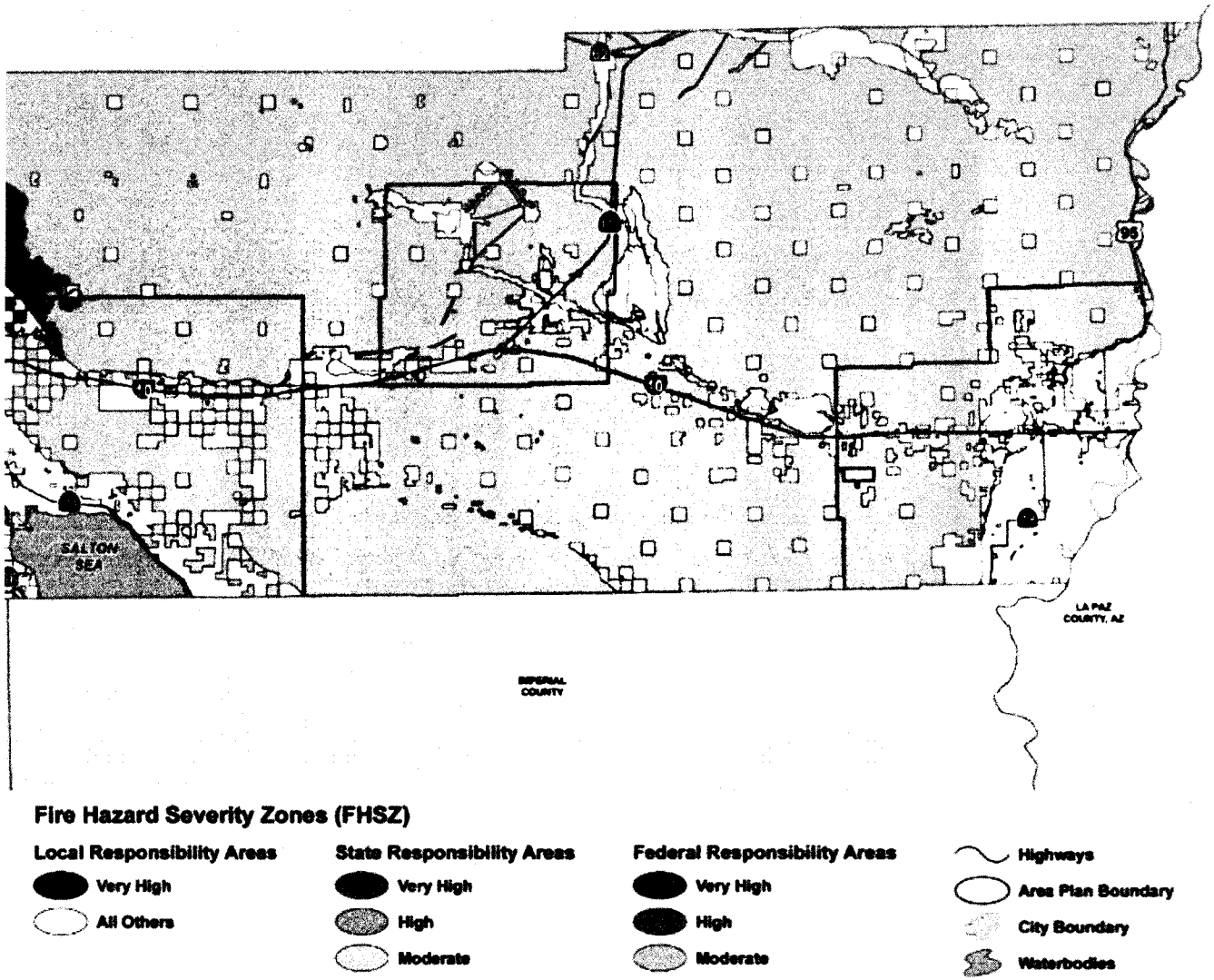
- Little or No Threat
- Moderate
- High
- Very High
- Extreme

The following two maps are maps of Fire Hazard Severity Zones. They show the wildfire susceptibility Risks and the local responsibility area, and the state or federal responsibility areas.

Map 25: Western Riverside County Wildfire Susceptibility Risks Map



Map 26: Eastern Riverside County Wildfire Susceptibility Risks Map



Risk Assessment

Fire is a continuous threat in Southern California, particularly in Riverside County. The major areas of concern are the wildland and urban interfaces. Hundreds of homes now border major forests and brush areas. With thousands of people living near and visiting wildland areas, the probability of human-caused fires is growing. Although occurring with less frequency, the threat of fire from lightning strikes also exists. The Idyllwild area, San Jacinto Mountains is heavily forested and high hazard area.

Generally, the dry seasons are a major time for an increase in the number of forest fires and structure fires. The standard "shake roof" is a particular hazard, as is the poor control of flammable growth around structures. During times of the strong "Santa Ana" winds, fire danger is particularly high.

The increase of industrial complexes, transportation networks, and utility networks pose a threat that is not seasonal, but rather year-round. Associated with industry and transportation networks is the ever present problem of hazardous materials. Although not necessarily a wildland threat, a fire occurring in an urban area involving hazardous materials could have serious consequences.

Due to the undeveloped and rugged terrain in parts of Riverside County, highly flammable brush- covered land, and long, dry summers, many portions of the County have experienced numerous wildland fires in the recent past.

- **Effects on people and structures.** The effects on people and housing can be significant. Many fires shown in the table above resulted in the evacuation of homes. Wildfires have the potential to destroy residential and commercial buildings, as well as critical infrastructure.

- **Effects on infrastructure.** Due to destroyed powerlines, wildfires often result in power outages. These outages can be extensive in geographic area and numbers of persons affected.

- **Effects on Critical Facilities.** There are approximately 15 fire stations that are in potential direct risk from wildland fires. There are additional critical locations within the Idyllwild area that are at a high danger risk from wildland fires. In many cases (i.e. fire stations and schools) these facilities cannot be relocated into a safer area.

- **Effects on agriculture.** Effects on agriculture can be devastating. In addition to the obvious impacts on animals and crops, wildfire can have deleterious effects on soil and water that will affect agriculture for an extended period of time.

Relationship to Other Hazards – Cascading Effects

Major wildfires can completely destroy ground cover causing flooding and erosion. If heavy rains follow a major fire, flash floods, heavy erosion, landslides and mudflows can occur. These cascading effects can have ruinous impacts on people, structures, infrastructure, and agriculture.

Risk Assessment Conclusion.

The western end of Riverside County is far more susceptible to wildfire than the eastern end of the County. The effects can be far-reaching in terms of the number of acres involved, the toll on human life, and the economic consequences. Wildfire will continue to be a high-risk hazard for Riverside County.

5.3.4 Electrical Failure – Power Outage

Severity: 4

Probability: 4

Risk Score: 2.00

OA Jurisdictions Affected by Power Outage Incidents

- Cathedral City
- City of La Quinta
- City of Palm Springs
- Desert Water Agency
- Imperial Irrigation District
- Western Municipal Water District

Hazard Definition

Identifying Energy Shortage Hazards

California continues to experience both population growth and weather cycles that contribute to a heavy demand for power. Climate change may also increase California's vulnerability to energy shortage hazards. Predicted increases in heat waves, as well as increasingly severe winter storms, will put ever greater strain on California's electricity system.

Hydro-generation provides approximately 20 percent of California's electric power, with the balance coming from fossil fuels, nuclear, and renewable sources. Rotating outages and/or blackouts such as those experienced in 2000 and 2001 can occur due to losses in transmission or generation and/or extremely severe temperatures that lead to heavy electric power consumption.

The electric power industry does not have a universal agreement for classifying disruptions.

Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. Electric power disruptions can be generally grouped into two categories: intentional and unintentional.

There are four types of intentional disruptions:

1. Planned (Maintenance): Some disruptions are intentional and can be scheduled. For example, a disruption may be necessary when components of the power system are taken out of service for maintenance or upgrading. Scheduled intentional disruptions can last from several minutes to several hours, and customers are usually notified in advance.

2. Unscheduled (Repair): Some intentional disruptions must be done "on the spot." As a result, advance notice cannot be provided. For example, a fire department or a police department may request a disruption in service during a fire or an accident.

3. Demand-Side Management: Some customers (i.e., on the demand side) have entered into an agreement with their utility provider to curtail their demand for electricity during periods of peak system loads. In return for agreeing to these disruptions, these customers receive a lower electric rate and/or a rebate.

4. Load Shedding (Rotating): When the power system is under extreme stress due to heavy demand and/or failure of critical components, it is sometimes necessary to intentionally interrupt the service to selected customers to prevent the entire system from collapsing. In such cases, customer service (or load) is cut, sometimes with little or no warning. One form of load shedding called a "rotating blackout" involves cutting service to selected customers for a predetermined period (usually not more than two hours). As power is restored to one block of customers, the power to another block of customers is interrupted to reduce the overall load on the system.

Unintentional or unplanned disruptions are outages that come with essentially no advance notice. This type of disruption is the most problematic. The following are categories of unplanned disruptions:

- Accident by the utility, utility contractor, or others.

- Malfunction or equipment failure due, for example, to age, improper operation, excessive operation, or manufacturing defect; special subcategories cover broken fuse links and underground cable, joint, or termination failures.

- Equipment overload (utility company or customer).

- Reduced capability (equipment that cannot operate within its design criteria).
- Tree contact other than from storms.
- Vandalism or intentional damage.
- Weather, including ice/snow, lightning, wind, earthquake, flood, and broken tree limbs taking down power lines.
- A wildfire that damages transmission lines.

Table 24: Riverside County Power Outages (1993-2017)

Location	Date	Incident Description
Riverside County	10/28/1993	Variety of fires. 129 structures destroyed. Power outages. 6 injuries.
Greater Jurupa Area	1/6/1996	Property damage, power disruption, road damage.
Beaumont	2/17/1999	60mph winds damaged roofs, downed trees and power lines, and created a dense dust storm. A plume of dust penetrated homes and covered all surfaces and filled closets and cupboards. Yards had 3" to 6" of silt. 1128 homes damaged. 27 vehicles.
Hector Mine Earthquake	10/16/1999	Minor damage to buildings, power interruption, communication interruption, gas line break causing a leak.
Blythe	8/23/2000	Power outage from storms. Provided shelter for 24 people.
Desert Cities	8/27/2000	Thunderstorm and wildfires caused power interruption. 2,800 customers without power.
Eastern Coachella Valley	7/3/2001	Power failure. Several thousand people affected.
Riverside County	2/9/2002	High wind. Damage throughout the County. Roof damage, structure fires, wildfires started but were contained before 15 acre point. Power outages from the wind.
Moreno Valley	7/22/2002	51 home blackout. Transformer fire. Illegal dumping of used motor oil into the transformer vault.
Mira Loma, Jurupa, Rubidoux, Pedley, Sky Country	1/6/2003	High wind caused road closures, downed trees and power lines. Semi-truck overturns. Power outages affecting 10,000. Fire.
Riverside County	1/14/2003	Power lines down with 936,569 people affected, trees felled, homes damaged, fire triggered from downed lines,

Elsinore, Hemet, Moreno Valley, Perris, San Jacinto and Temecula in the southeastern area of Riverside County	4/23/2009	Substation load interruption led to loss of power to 280.000 residents
Riverside County, Orange County, parts of Arizona and Mexico	9/8/2011	Cascading outages led to approximately 2.7 million customers without power due to an 11-minute system disturbance. Power loss lasted as long as 12 hours for some affected. Riverside County's Imperial Irrigation District was directly affected.
Thousand Palms, Indio and Desert Hot Springs	4/30/2014	A cut fiber ring led to communication failure for 261 residents. Power outages for 10,500 residents due to windy conditions.
Riverside	3/11/2016	Micro-burst caused down powerlines and power outages, 3,000 people affected.
Riverside	4/29/2016	Power outage led to 20,020 SoCal Edison customers affected.
Moreno Valley	2/10/2017	8,137 residents lost power due to substation malfunction
Riverside University Health System	5/11/2017	Scheduled maintenance required the hospital to switch to partial generator power for 16 hours.
Desert Reginal Hospital	5/17/2017	Experience power outage and ran off generators for
Riverside	10/26/2017	Load shedding caused loss of power to 104,000 residents

Risk Assessment

The possibility of catastrophic damage to property or loss of life due directly to power failure is slight. An individual could lose their life if they come into contact with a downed power line. Although the risk of a power outage is high, the direct damage potential is low.

Power outages or interrupted service often occur during electrical storms and high winds. Wildfires also cause power outages in Riverside County. There is a very real possibility of a widespread blackout due to the earthquake.

- **Effects on people and housing.** Impacts due directly to power failure are slight. If the persons require electric powered medical equipment, they will be at greater risk. In the areas of the county that can be impacted by high temperatures, or very cold temperatures, a power outage can have an on the heating or cooling abilities.

- **Effects on commercial and industrial structures**. Impacts due directly to power failure are slight. If the outage lasts many days, the impact would be of a greater severity.

- **Effects on infrastructure.** Impacts to the ability of infrastructure in the area of failure• to support emergency response may be significant, although not permanent.

- **Effect on Critical Facilities.** Most critical facilities are required to have a back- up generator, but there is no official list of "all" critical having and maintain working back- up generators. Depending on the facility, the power outage can have strong effects on parts of the population that need medical devices, also for cooling and heating purposes.

- **Effects on agriculture.** Impacts due directly to power failure are slight.

Relationship to Other Hazards – Cascading Effects

As noted, other hazards such as an earthquake, wildfire, electrical storms, and high winds may be causes of blackouts.

Risk Assessment Conclusion

The County needs to be prepared to restore power should there be a failure due to downed lines caused by another hazardous condition or any other reason.

5.3.5 Emergent Disease/Contamination

Severity: 3

Probability: 3

Risk Score: 1.69

OA Jurisdictions Affected by Emergent Disease/Contamination

- All incorporated cities of Riverside County
- Unincorporated areas of Riverside County

Hazard Definition

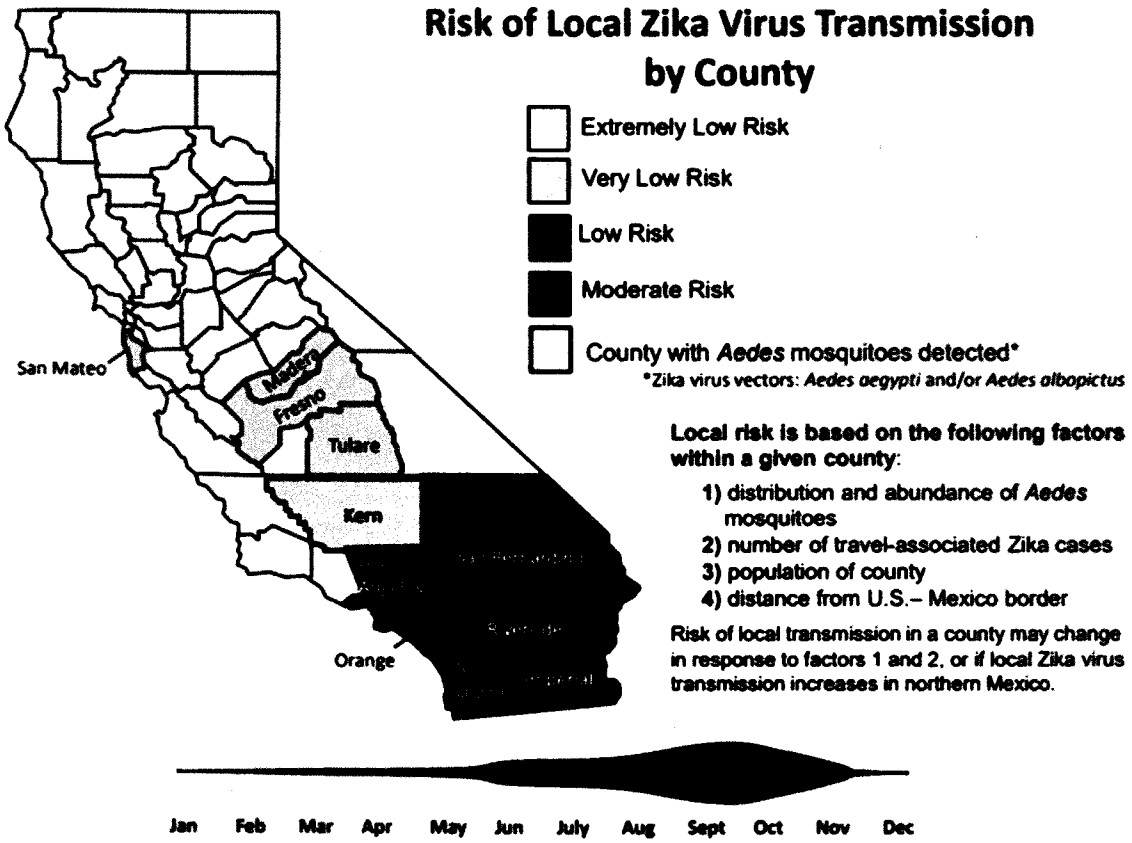
According to the Center for Disease Control, the term "emerging infectious diseases" refers to diseases of infectious origin whose incidence in humans has either increased within the past two decades or threatens to increase in the near future. Emergent diseases are new, new to the area, reappearing in the area after being fairly dormant, or a strain has become resistant to antibiotics. These illnesses are caused by bacteria, viruses or fungi that have entered into the body and began to multiply. Infectious diseases can be spread throughout the County population in a number of different ways:

- Vector (Bug bites)
- Person to person
- Contaminated food water or soil

Zika

Zika is a virus that is predominantly transmitted through the vector. Female Aedes ageypti are more dangerous than males. This is due to the fact that females have blood meals and males do not. They also spread the infection through laying eggs in standing water. Riverside County has detected Aedes ageypti, however, the ones that have been tested do not carry the virus. The reported cases in Riverside County have all been travel related illnesses. The threat of transmission is still present due to the potential sexual transmission of the virus.

Figure 33: Zika Risk Map by County



Source:https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/LocalZikaRiskMap.pdf

Ebola

Ebola is dominant in African countries, though with the ease of travel it has the potential to make its way to California. It is transmitted through blood, bodily fluids, direct contact with broken skin, contaminated needles and infected primates. When infected it can be fatal. Ebola can spread rapidly within Health Care Facilities when staff are not properly trained of not wearing adequate personal protective gear.

Risk Assessment

- **Effects on people and housing.** The risk to people can be severe, leading to hospitalization and possibly loss of life. Damages to housing as a result of Pandemic Flu are not likely.

- **Effects on commercial and industrial structures.** The risks are minimal to structures.

- **Effects on infrastructure.** The risks are minimal, but if there is an emergent outbreak the risk to people will lessen the numbers of workers that can go to their regular employment, which can strain the maintaining the infrastructure. Continuity of Business and of Government may become an issue. Outbreaks also but a strain on schools, hospitals, doctor offices and businesses.

- **Effects on agriculture:** Agriculture can be devastatingly affected by emergency diseases. There are a number of vector borne illnesses that can affect livestock such as Lyme disease, Salmonella and rabies. Plant pests or viruses can cause huge losses in crops that can threaten food safety and farmer livelihood stability.

History of Events

2015/17 – Zika was confirmed in Riverside County in 2015 with 14 infections. In 2017, there were 2 confirmed cases. All cases were travel related. Report accuracy reflects confirmed cases. Due to the symptoms mirroring a cold, the number could be higher but the mortality rate for this disease is very low. Its greatest impact is on a pregnant woman. 153 cases were reported within the state of California as of August 2016. Sexual transmission is a possibility with this virus. Transmitting mosquitos, Aedes ageypti, are present within the County.

2014/16 – Riverside County was alerted of the 2014 West Africa Ebola Outbreak in West African countries. Worldwide, a total of 1,975 cases where confirmed and 1,069 deaths were reported in August 2014. In 2016 the numbers had grown to 15,261 confirmed cases and 11,325 fatalities, It was the largest outbreak in history. Infection Control Measures were released from the Riverside Department of Public Health to first responders and EMS professionals. Though Riverside did not experience an outbreak or confirm a case, they were on high alert of the potential spread of the disease.

2015 – West Nile was contracted by 737 people within the county and there were 45 reported deaths.

2013 – Large scale Tuberculosis testing. 2 cases were confirmed and 72 were treated for latent TB infections.

2004 – Botulism Type A was detected in four inmates with in Riverside County.

2003 – West Nile Virus was detected in birds in the City of Riverside and the Coachella Valley. There was one reported human case within the County. Imperial and Los Angeles Counties also reported human cases.

Relationship to Other Hazards – Cascading Effects

This hazard has the potential to impact EMS first responders and Health Care Facilities. In the event that the timing of an outbreak coincided with another hazard, the healthcare impact could be extensive.

Risk Assessment Conclusion

Public Health Departments for the County, State, nation and the world constantly monitor all emerging diseases. This gives medical personnel the necessary time to prepare or mitigate possible effects of an emerging disease.

As a result of the Ebola and Zika outbreaks, Riverside County EMS Agency released Policy 3307, Emerging Viruses. Its purpose is to specify procedures to be followed when highly pathogenic emerging viruses are suspected during emergency call taking and response, or confirmed prior to interfaculty transport.

5.3.6 Cyber Attack

Severity: 2

Probability: 4

Risk Score: 1.50

OA Jurisdictions Affected by Cyber Attack

- All incorporated cities of Riverside County

Hazard Definition

Cyber-terrorism is the use of computer network tools to shut down critical government infrastructures such as energy, transportation, and government operations, or to coerce or intimidate a government or civilian population. The premise of cyber terrorism is that as nations and critical infrastructure became more dependent on computer networks for their operation, new vulnerabilities are created. A hostile nation or group could exploit these vulnerabilities to penetrate a poorly secured computer network and disrupt or even shut down critical public or business operations.

The goal of cyber terrorism is believed to be aimed at hurting the economy of a region or country, and to amplify the effects of a traditional physical terrorist attack by causing additional confusion and panic.

Cyber-terrorism. Recent incidents illustrate the County's vulnerability to cyber- terrorism.

- **Effects on people and housing**. If a Cyber-attack were to happen at a Healthcare Facility the effects could be detrimental to patients. Sensitive Security Information could be obtained and the hackers could release patient files, payment information and other personal data that could harm individuals and employees.

- **Effects on commercial and industrial structures**. Depending on levels of contamination and exposure, effects could range from minimal to devastating.

- **Effects on infrastructure**. Cyber-terrorism can have profound effects on infrastructure. If an attack were to happen in a critical facility it could potentially make it inoperable.

- **Effects on agriculture.** Depending on levels of contamination and exposure, effects could range from minimal to devastating.

History of Events

In 2016 the County of Riverside Emergency Management Department was targeted for a ransomware attack that resulted in a disruption of work. It also affected the DOC shared drive, which could have hindered response to a disaster.

Relationship to Other Hazards - Cascading Effects

Cyber-attacks have the ability to shut down entire facilities. If an attack were to happen during a disaster it could greatly affect the response of first responders and EOC personnel.

Risk Assessment Conclusion

Cyber-attacks happen within the County on a daily basis. The Riverside County Information Technology Department (RCIT) has multiple prevention systems in place that protect County servers and network systems. RCIT monitors County systems 24 hours a day and has the Albert Sensor that will report to the Center for Internet Security (CIS), Multi-State Information Sharing and Analysis Center (MS-ISAC) all Domain Name System (DNS) and NetFlow traffic for correlation with the Department of Homeland Security's threat intelligence database for real-time alerting of malicious network connections to blacklisted IP address on the Internet. Another implemented system is the Enterprise Breach Detection System that inspects all internal/lateral county network traffic for indicators of compromise (IOCs) enabling the ISO to rapidly detect, respond to, contain, and prevent cyber-attacks, malware outbreaks, network reconnaissance, data exfiltration, and C2 (command & control) and botnet activities.

RCIT is also in the process of implementing more programs for the safety of the County's networks. Due to the level of security, the threat of a Cyber-attack is fairly low, but the potential damages could be very damaging.

5.3.7 Terrorist Event

Severity: 3

Probability: 1

Risk Score: 1.13

OA Jurisdictions Affected by Terrorism

- All incorporated cities of Riverside County
- Unincorporated areas of Riverside County

Hazard Definition

Terrorism is the use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives. Terrorist acts or and acts of war may cause casualties, extensive property damage, fires, flooding, and other ensuing hazards.

Terrorism takes many forms, including:

- Chemical
- Biological
- Radiological
- Nuclear
- Explosive
- Cyber-terrorism
- Active shooters
- Vehicle Ramming

Chemical: Chemical weapons have been used primarily to terrorize an unprotected civilian population and not as a weapon of war. This is because of fear of retaliation and the likelihood that the agent would contaminate the battlefield for a long period of time.

Some analysts suggest that the possibility of a chemical attack would appear far more likely than either the use of nuclear or biological materials, largely due to the easy availability of many of the necessary precursor substances needed to construct chemical weapons. Additionally, the rudimentary technical knowledge needed to build a working chemical device is taught in every college level chemistry course in the world.

Some chemical agents are odorless and tasteless and are difficult to detect. They can have an immediate effect (a few seconds to a few minutes) or a delayed effect (several hours to several days).

Biological: Biological weapons are defined as any infectious agent such as a bacteria or virus used to produce illness or death in people, animals, or plants. This definition is often expanded to include biologically-derived toxins and poisons. Biological agents can be dispersed as aerosols or airborne particles. Terrorists may use biological agents to contaminate food or water because the agents are extremely difficult to detect.

Radiological: A radioactive material is a material made up of unstable atoms which give off excess energy in the form of radiation through the process of radioactive decay.

Radiation cannot be detected by human senses. Wherever radioactive materials are used, transported, or stored there is a potential for a radiological accident to occur. Some of their most common uses include:

- By doctors to detect and treat serious diseases.
- By educational institutions and companies for research.
- By the military to power large ships and submarines.
- By companies in the manufacture of products.
- As a critical base material to help produce the commercial electrical power that is generated by a nuclear power plant.
- As one of the critical components in nuclear weapons, which are relied upon to help deter the threat of war.

Nuclear: The possibility exists that a terrorist organization might acquire the capability of creating a small nuclear detonation. A single nuclear detonation in the United States would likely produce fallout affecting an area many times greater than that of the blast itself. There is also the possibility that a terrorist will construct a "dirty bomb", a bomb that is used to distribute nuclear-contaminated materials. It would have less of an effect than a "traditional" nuclear bomb, but the terror effect on the population would be great.

Explosive: The possibility exists that a terrorist may attack with conventional explosives, particular in a public setting. Innumerable incidents have occurred around the world involving car bombs, truck bombs, and bombs attached directly to terrorist individuals.

Cyber Terrorism: Please see Section 5.3.6

Active shooters: Active shooter events in the nation have increased dramatically over the last 17 years. According to the report "a Study of Active Shooter Incidents in the United States Between 2000 and 2013" produced by the Department of Justice, it states that there have been 160 Active Shooter incidents from 2000-2013. Furthermore, in the updated version of that report for 2014-2015, it states that there has been an additional 40 Active Shooter incidents spanning 26 states. These attacks have led to 92 casualties and 139 wounded.

Vehicle Ramming: The use of vehicle ramming has steadily increased and it is likely that this tactic will continue to rise. This attack style required little specialized training or skill and poses little risk to the assailant. It is seen as an effective style due to its minimal detection when acquiring the weapon and overall flexibility when planning target location and targets. Known terrorist organizations encourage ramming and have even released tips on maximizing casualties.

History

Fortunately, Riverside County has little history of incidents of terrorism. However, threats and incidents have been on the rise over the last 17 years.

Riverside County has also been impacted by terrorist acts in surrounding counties. On December 2nd, 2015 a disgruntled employee shot and killed many former coworkers in San Bernardino County. The "Waterman Incident" affected Riverside County in the following ways:

- Activation of the Riverside County Medical Health Operational Area Coordinator (MHOAC) for outreach to Riverside Environmental Health and Riverside Behavioral Health representatives.
- The MHOAC completed a comprehensive list of available Riverside resources (to include name, contact info, and wrap around service requirements).
- The MHOAC provided the resource list to the Regional Disaster Medical Health Specialist (RDMHS).
- Riverside Environmental Health sent 63 employees and Behavioral Health sent 89 employees to San Bernardino County to support the initial response and re-establishment of the San Bernardino County Environmental Health Division from December 2015 through June 2016.

Risk Assessment

Chemical. A terrorist would not have to build a complicated chemical release device. During favorable weather conditions, an already existing chemical plant could be sabotaged or bombed releasing a toxic cloud to drift into a populated area. The result could be just as dangerous as having placed a smaller chemical device in a more confined space. This type of incident would cause the maximum amount of fear, trepidation, and potential panic among the civilian population, and thus achieve a major terrorist objective.

Biological. The agents are cheap, easy to make, and simple to conceal. Even small amounts, if effectively deployed, could cause massive injuries and overwhelm emergency rooms. The production of biological weapons can be carried out virtually anywhere — in simple laboratories, on a farm, or even in a home.

However, experts say it remains very difficult to transform a deadly virus or bacterium into a weapon that can be effectively dispersed. A bomb carrying a biological agent would likely destroy the germ as it explodes. Dispersing the agents with aerosols is challenging because biomaterials are often wet and can clog sprayers. Most agree that, while a biological attack could be devastating in theory, in reality, the logistical challenges of developing effective agents and then dispersing them makes it less likely a terrorist could carry out a successful widespread assault.

Radiological/Nuclear. Under extreme circumstances an accident or intentional explosion involving radiological materials can cause very serious problems. Consequences may include death, severe health risks to the public, damage to the environment, and an extraordinary loss of, or damage to, property.

Explosive. While generally more limited in the extent of the damage inflicted, explosive terrorist attacks may have consequences including death and damage to property. Targets would include county fairs, music festivals, critical facilities and sporting events.

Active shooters: The increase of violent crimes throughout the nation has increased awareness within Riverside County. The possibility of an attack has increased. Though the threat to infrastructure is fairly limited this hazard could result in loss of life, injury and economic disruption. Targets could include public events, government facilities, schools and shopping centers.

Vehicle Ramming: This terrorist tactic has been increasing over the last five years. Riverside County has a very low history of this event but moderate probabilities of it happening again. This tactic is very hard to detect and mitigation is extremely difficult to

carry out. Riverside County Sheriff's Department has increased their awareness of this terrorist style in an attempt to foil any attempted ramming incident.

Extremists, especially in European countries have moved towards filling the vehicles with explosives to increase the number of fatalities in an attack. Though this approach has not yet made it to Riverside County, the potential threat has increased.

Relationship to Other Hazards – Cascading Effects

Terrorism has the potential to cause a cascading event. After a terrorist incident people may display signs of civil disorder driven by fear.

Risk Assessment Conclusion.

The western end of Riverside County is far more susceptible to terrorism than the eastern end of the County. The effects can be far-reaching in terms of the number of buildings involved, the toll on human life, and the economic consequences.

5.3.8 Communications Failure

Severity: 3

Probability: 2

Risk Score: 1.13

OA Jurisdictions Affected by Network Communications Failure

- All incorporated cities of Riverside County
- Unincorporated areas of Riverside County

Hazard Definition

CoRNet

The County of Riverside Network (CoRNet) provides Voice and Data communication for most County departments and facilities. CoRNet is a distributed design consisting of Regional Hub locations to which sites in each region have their point to point circuits connected. Each of these Hub locations is then connected to its adjacent Hub locations via high bandwidth circuits.

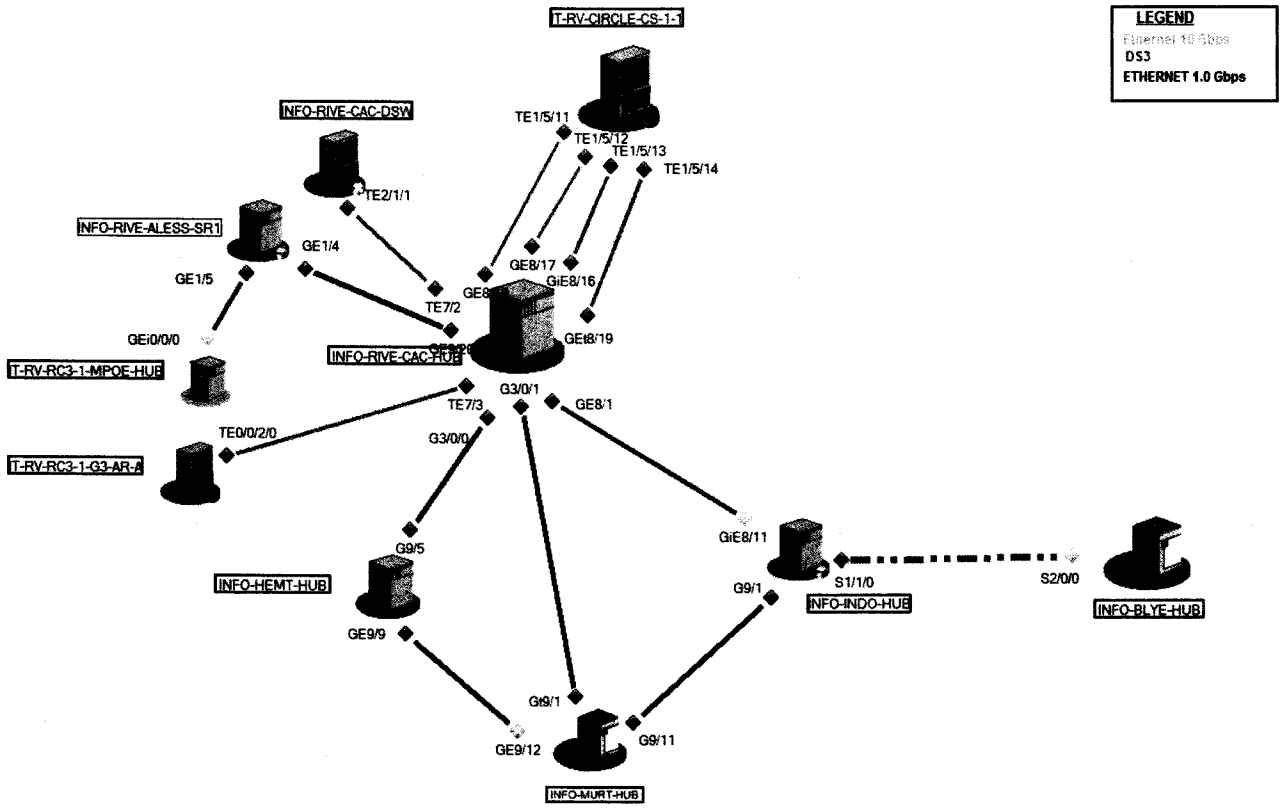
Voice Services are controlled from the County Administration Center Hub with redundancy provided by the Indio Hub location. Application Services and Internet Services for the County are delivered via the County Administration Center Hub location and soon from the RC3 Data Center.

With the completion of the Converged Network Project in 2016, CoRNet now provides both Voice and Data over the same network infrastructure. The same network connection that provided a data connection for the customers hardwired PC's now provides the connectivity for all phone communications and wireless devices.

A loss of Network connectivity now impacts both Voice and Data and wireless (Wi-Fi) communications. In the event of a Communication Failure, the entire County would be affected.

There are multiple hazards that could result in a "Network" failure such as Earthquake, Power Outage and other Natural Disasters.

Network Map



Indio Hub Failure

- Sites impacted
  - All CoRNet connected Desert locations
- Services impacted
  - All Voice, Data and Wifi services for this region.

Murrieta (SWJC) Hub Failure

- Sites impacted
  - All CoRNet connected South County locations
- Services impacted
  - All Voice, Data and Wifi services for this region.

Hemet Hub Failure

- Sites impacted
  - All CoRNet connected Hemet area County locations
- Services impacted

- All Voice, Data and Wifi services for this region.

Riverside Hub Failure

- Sites impacted
  - All Central Riverside locations (Voice, Data and Wifi)
  - All County Hubs will lose all application and Internet based services
  - All State and Vendor provided application services.
- Services impacted
  - All Voice communications for Central Riverside locations.
  - All other Hubs would fail over to the Indio Hub for Voice.
  - All County Hubs will lose all application, Internet and Wifi based services.

PSEC

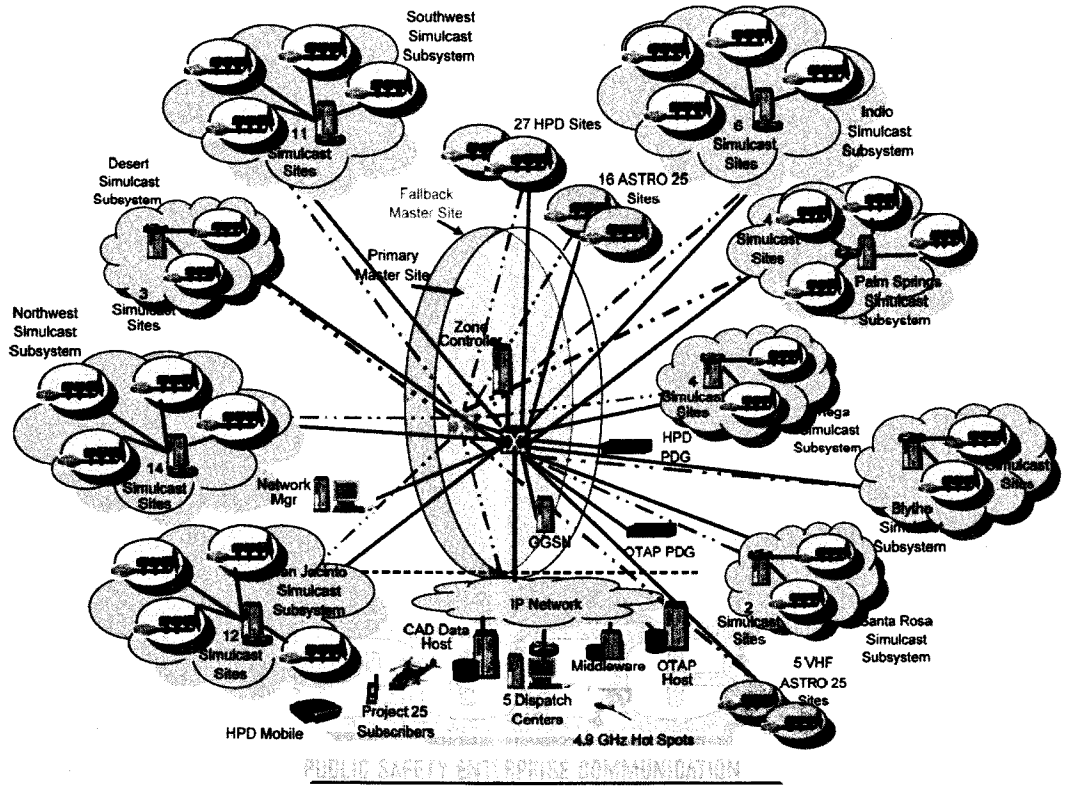
The Riverside County Information Technology/Public Safety Enterprise Communications (RCIT/PSEC) Division provides public safety communications for all participating City and County law enforcement, fire service, public works, and allied agencies in Riverside County. In January of 2014, RCIT/PSEC replaced an aging countywide Enhanced Digital Access Communications System (EDACS) system with a Motorola 7.x APCO P25 Phase 2 high availability and Dynamic System Resilience voice radio system and a High-Performance Data system with a mobile VPN client for multiple network access. PSEC provides and manages all aspects of Public Safety Radio Services and mobile data for participating agencies which include almost all County agencies and the city police departments of Banning, Murrieta, Riverside, and Corona.

Thirty plus full-time staff provide 24/7/365 Public Safety Communications for over 6,800 voice and data mobile users who operate over a 7,303 square mile area. The PSEC radio system provides all levels of government communications for the 2,189,641* residents of Riverside County including first responder dispatch for Law Enforcement 9-1-1 Dispatch Centers. The staff maintains:

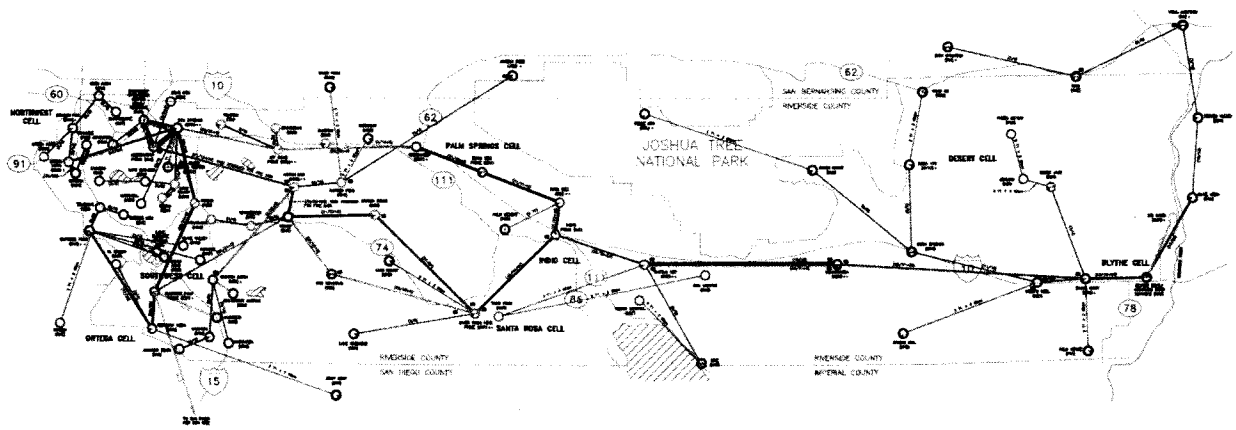
- 76 radio and microwave remote sites
- 75 PSEC radio Voice and Data transmitter Sites
- 1 – Primary Motorola (M)- Core Site
- 1 Motorola (M) Core Dynamic System Resilience (DSR) Site
- 86 licensed Microwave Hops
- Approximately 5500 Voice Users
- Approximately 1300 Mobile and Tablet Data Users
- 8 Dispatch Centers

The PSEC Division of RCIT processed 24,421,574.0 Public Safety Transmissions for FY16/17

Figure 34: PSEC System Architecture



Map 27: PSEC Sites and Microwave Interconnectivity across 7200 Square miles of Riverside County, CA



System Redundancy

A significant and material attribute of the System is how it performs during various failure conditions. The PSEC ASTRO 25 Radio System is designed with multiple levels of redundancy and the ability to provide continued communications should failures occur. Because the System can be a lifeline to County users and citizens, there is no tolerance for System failure. The System can withstand multiple failures and still provide full-featured trunked communications.

At each remote site, dispatch location and Master site, components that have the potential to interrupt communications have been backed up with redundant components. The system is designed such that multiple component failures must occur before users will notice a degradation in performance (other than a brief period during the switch over to a redundant component).

Master Sites

There are two Master sites, one in Riverside on Alessandro Street and one in Blythe. In the event of a catastrophic failure of the Alessandro Master site, the Blythe Master site will take over operation of the entire system. In the event of a loss of microwave communications links between the east side and the west side of the county, the Blythe Master site can take over system operations in the east county, while Alessandro will continue to control the west county. In this scenario, dispatchers at Alessandro or Palm Desert would not be able to reach units operating on the east side of the county, nor would Blythe dispatchers be able to reach units operating in the west.

History of Events

CoRNet

Riverside County has not experienced a large scale Communication Failure with CoRNet.

PSEC

In early 2017 the PSEC radio system had a technical issue that led to the temporary disruption of 911 services in the Indio/Palm Springs area.

Risk Assessment Conclusion

CoRNet

As RCIT continues working toward redundancy in many areas (Data Center, MPLS, Redundant Internet Connections etc.), it is important to understand the scope of an outage depending on where it occurs on CoRNet under the current design.

While a single Hub failure would only impact the locations serviced through that Hub. Other hub locations would not be affected. A failure of the Riverside Hub would have a widespread impact. A failure at the Riverside Hub would result in the loss of all Application, Internet and Wi-Fi services for the entire county.

PSEC

The RCIT/PSEC Division has developed hardened sites to maintain Public Safety two-way communications to support first responders during natural disasters and civil disturbance. All of the microwave and core sites are hardened with towers that are rated to either 85 or 120 mph wind, Seismic Zone 4, and are maintained by professionals dedicated to Public Safety Communications.

The PSEC system is highly redundant with several layers of fault tolerance. There are multiple routing paths for routers, switches, trunked repeaters, overlapping coverage and core roaming services. Although individual sites may be affected by a major earthquake or another disaster, the PSEC system has been designed to offer a high level of operability overall.

Restoration of downed infrastructure could take hours to a month(s) depending on the severity of the damage with the worst case being a loss of physical infrastructure.

The PSEC system has already performed well in minor earthquakes and major fires. The system has also been highly available on a day to day basis. The probability of the system working to support first responders is high if the PSEC Division properly maintains the system and is funded to do so.

The Core and Radio Network Interface (RNI) has intrusion detection and is isolated from the outside with multiple layers of firewalls to protected from Cyber Attacks. A comprehensive assessment by RCIT ISO and the manufacturer Motorola was performed when the PSEC radio system was deployed. RCIT ISO can be contacted to provide more details on how the RCIT network is protected

Relationship to Other Hazards – Cascading Effects

Any loss of The RCIT/PSEC Public Safety Voice and Data system would affect first responder performance during emergencies of all types in Riverside County for Law, Fire, EMS and local government entities like Public Works.

5.3.9 Flood

Severity: 3

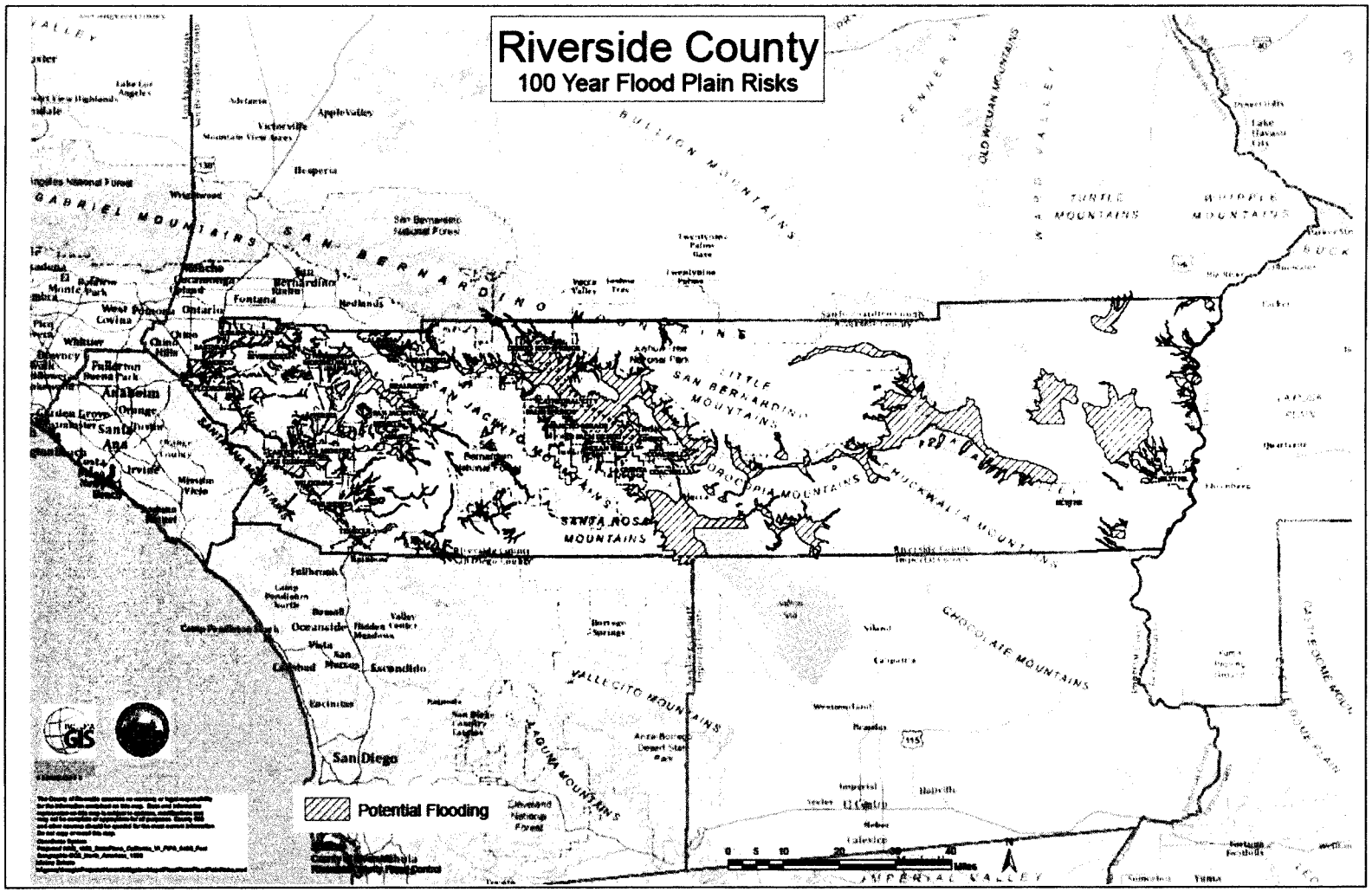
Probability: 3

Risk Score: 1.13

OA Jurisdictions Affected by Flooding

- City of Blythe
- City of Calimesa
- City of Canyon Lake
- City of Cathedral City
- City of Desert Hot Springs
- City of Eastvale
- City of Indian Wells
- City of Jurupa Valley
- City of La Quinta
- City of Lake Elsinore
- City of Norco
- City of Palm Desert
- City of Perris
- City of San Jacinto
- City of Temecula
- City of Wildomar
- Rancho California Water District
- Riverside County Office of Education
- Riverside Unified School District

Map 28: Riverside County 100 Year Flood Plain Risks



Hazard Definition

A flood is defined as an overflowing of water onto an area of land that is normally dry. Floods generally occur from natural causes, usually weather-related, often in conjunction with a prolonged period of seasonal precipitation or with sudden and very heavy rain falls. Floods can, however, result from human causes as a dam impoundment bursting. Dam break floods are usually associated with intense rainfall or prolonged flood conditions. In the Riverside County area, a major earthquake could cause a dam failure. In a dam failure scenario, the greatest threat to life and property typically occurs in those areas located immediately below the dam since flood depths and discharges generally decrease as the flood wave moves downstream.

Floods are generally classed as either slow-rise or flash floods. Slow-rise floods may be preceded by a warning time lasting from hours to days, or possibly weeks. Evacuation and sandbagging for a slow rise flood may lessen the flood-related damage. Conversely, flash floods are characterized by extremely short warning times.

Hydrologic Regions

Although Riverside County occasionally experiences periods of significant drought, the County can also experience periods of substantial rainfall. When Riverside County does experience heavy rain, or rain over a period of days or weeks, many areas of the County are subject to flooding. Runoff from rain drains either naturally into rivers, washes, and creeks or into flood control facilities. Flash flooding is also a common problem, especially in the Coachella Valley and the easterly portions of the county. Flash flooding is typically associated with short duration, high-intensity precipitation events often associated with summer thunderstorms. Such events can occur even during a drought.

The topography of the County varies from mountainous areas several thousand feet above sea level to low desert areas that are actually below sea level. Riverside County falls within two distinct Natural Hydrologic Regions as described in the State of California Multi-Hazard Mitigation Plan (SHMP):

South Coast Region

The South Coast hydrologic region extends up from the U.S. - Mexico border to the Tehachapi, San Bernardino, San Gabriel, and San Jacinto mountains. Nearly one-third of the area is coastal plain. This region contains major urban centers, including the counties of Los Angeles, Orange, and San Diego. Much of the flooding is sudden and severe, resulting in massive slides, debris flows, and mudflows. The western portion of

Riverside County falls within the South Coast Region and contains portions of the Santa Ana River, San Jacinto River and Santa Margarita River watersheds.

Colorado River – Desert Region

The dominant hydrologic features of this region are the Colorado River, which forms its eastern boundary, and the Salton Sea, which lies just shy of its western boundary. The region is marked by the San Bernardino and San Jacinto mountains. The region is also bounded by the U.S.- Mexico border to the south and the South Lahontan region to the north. This is generally a sparsely populated agricultural region that experiences sporadic flooding; however, the upper Coachella Valley has a much higher population density. Both common winter storm events and summertime monsoonal flows from Mexico's Pacific Coast can spawn massive rainstorms, general flooding and flash floods. The Eastern portion of Riverside County falls within the Desert Region and contains portions of the Whitewater River and Colorado River watersheds.

Characteristic Weather Patterns

In Riverside County, various weather patterns are associated with flood events such as El Niño conditions, La Niña conditions, Summer Monsoons, and "Pineapple Express".

Floods that affect Riverside County can be attributed to three different types of storm events:

1. A general winter storm that combines high-intensity rainfall and a rapid melting of the mountain snow pack.
2. A tropical storm out of the southern Pacific Ocean.
3. A summer thunderstorm, particularly in the desert areas.

There are three principal types of flood hazards:

1. Stream flooding (including bridge scour and stream erosion)
2. Flash flooding (including debris and mud flows)
3. Sheet flow flooding (including alluvial fan flooding)

The major rivers in the South Coast hydrologic region of Riverside County are dry most of the year and pose flood threats to developments within the floodplain during general storms of long duration. When a major storm moves into the area, the excess precipitation becomes surface runoff. Resultant flood flows have predominantly short durations and

sharp peaks. Increased urbanization increases flood potential by increasing the percentage of impervious surfaces.

In the Desert hydrologic region, high-intensity rainfall from the period of July to August can produce severe flash flooding. Winter rains are generally more widespread in the desert and flash flood potential is less due to the lower intensity of rainfall. Winter rains are nonetheless capable of producing flooding but are somewhat more predictable. There is a severe danger to motorists who may attempt to drive through flooded washes which are typically dry.

Storms with high volumes of precipitation in a short period of time have occurred in the County causing flash floods, contaminated drinking water, disrupted electrical service, and damaged homes and contents. In addition, land that has been denuded of foliage and trees due to fire or human activity has experienced serious erosion from the rainfall.

Excessive precipitation can inundate soil in slopes causing mudslides and landslides. These events can destroy homes, block highways, and destroy power lines. The County is vulnerable to this type of flood damage. Heavy storms also can strand individuals playing near or crossing streams, rivers, flood control channels and intersections.

Riverside County has several major river systems, dams, and reservoirs. Excessive rainfall can stress these systems causing serious damage to property and potential loss of life. Rivers can overflow their banks, destroying bridges and washing out roads and highways during major flood events. Dam failure is discussed in a separate section of this LHMP on that specific hazard.

History

Table 25: Riverside County Flood History

Location	Date of Incident	Reported Damage	Number Injured	Incident Description
Riverside County	1/17/1993	$12,629,191	0	Flooding
Idyllwild	3/5/1995	$1,000,000	Not Avail.	Flooding caused by rains. 3,000 acres of farmland flooded. Portions of Highway 74 washed away
Mecca	3/6/1995	$1,000,000	2	Flooding caused by rains.
Riverside County	2/6/1998	12,629,191	0	El Nino storms flooding, debris, road damage water damage to homes

Cherry Valley, Calimesa, Yucaipa-Oak Glen Conservation Camp, Banning	7/11-12/1999	$750,000	3	Flash flood. Camp and property damaged.
Desert Hot Springs	3/5/2000	$300,000	1	Flooding caused by rain and snow
Moreno Valley	3/7/2000	$1,500,000	Not Avail.	Flooding caused by rain. Mudslides. Homes and property destroyed.
Eastern Riverside County	8/29/2000	Not Avail.	0	Flash flood due to severe thunderstorm, hail, heavy rain.
Eastern Riverside County	7/6/2001	$3,383,000	0	Flash flood. Road damage, farmland damage, crop damage.
County Areas & Riverside City	11/24/2001	Not Avail.	Not Avail.	Flood channel blocked. Homes flooded.
Moreno Valley, Cathedral City	8/18/2003	$500,000	Not Avail.	Flash flood Government buildings flooded
Anza, Banning	9/4/2003	$150,000	Not Avail.	Flash flood.
Corona, Palm Springs	11/12/2003	$10,000	0	Flash flood.
Mira Loma, Moreno Valley	2/2/2004	$10,000	Not Avail.	Flash flood.
Temecula, Riverside, Mira	2/18/2004	$55,000	Not Avail.	Flash flood.
Mira Loma, Moreno Valley, Perris, Sun City, Lake Elsinore	10/20/2004	$500,000	0	Flash flood.
Riverside County FEMA DR -1577	12/27/2004	Not Avail	Not Avail	Severe Storms, Flooding, Debris Flows and mud slides
Riverside County FEMA DR -1585	2/16/2005	Not Avail	Not Avail	Severe Storms, Flooding, Debris Flows and mud slides
Riverside County FEMA DR -1884	3/8/2010	Not Avail	Not Avail	Severe Storms, Flooding, Debris Flows and mud slides
Riverside County FEMA DR -1952	12/17/2010	Not Avail	Not Avail	Severe Storms, Flooding, Debris Flows and mud slides

Hemet, Coachella Valley and Thousand Palms	9/7-8/2014	Not Avail	Not Avail	Flash flooding in Coachella Valley. Mud and water closed roads and stranded vehicles in La Quinta, Palm Desert, and Thousand Palms. Homes in La Quinta were surrounded by water. Moving water was 3 feet deep on roads and 4 to 5 feet of standing water submerged vehicles.
Throughout County	12/3-4/2014	Not Avail	1	Flooding resulted, with mud, debris and water closing several roadways and stranding vehicles. Mud with debris 10 feet high piled up on Soboba Rd. north of San Jacinto. A swift water rescue was needed.
Throughout County	7/19/2015	Not Avail	1	Flooding in the county lead to the need for a swift water rescue, the washout of Interstate-10 near Desert Center, and neighborhood in and near Moreno Valley flooded causing damage to resident's homes and property.
Menifee	9/8/2015	Not Avail	Not Avail	Flooding
Temecula	1/5-7/2016	Not Avail	Not Avail	Flooding
Throughout County	2/27/2017	Not Avail	1	Flooding resulted from the storm. A swift water rescue was needed in Temecula. Heavy road damage disrupted traffic.

Source: https://www.weather.gov/media/sgx/documents/weatherhistory.pdf
http://www.cnrfc.noaa.gov/storm_summaries/dec2010storms.php
http://ks.water.usgs.gov/pubs/reports/wsp.2499.sumca0193.html
http://www.floodcontrol.co.riverside.ca.us/Downloads/AnnualReports/DistrictAnnualReport15-16.pdf

Flood Hazard Mapping

For floodplain management purposes, the following discussion describes the Federal Emergency Management Agency (FEMA) definition of "100-year flood." The term "100-

year flood" is misleading. It is not a flood that will occur once every 100 years. Rather, the flood elevation has a 1 percent chance of being equaled or exceeded each year. Thus, a 100-year flood could occur more than once in a relatively short period of time. The one percent chance flood is used by the National Flood Insurance Program (NFIP) as the minimum standard for floodplain management regulation and, in most cases, triggers the need for mandatory flood insurance coverage. A structure located within a FEMA Special Flood Hazard Area has a 26 percent chance of suffering flood damage during the term of a 30-year mortgage.

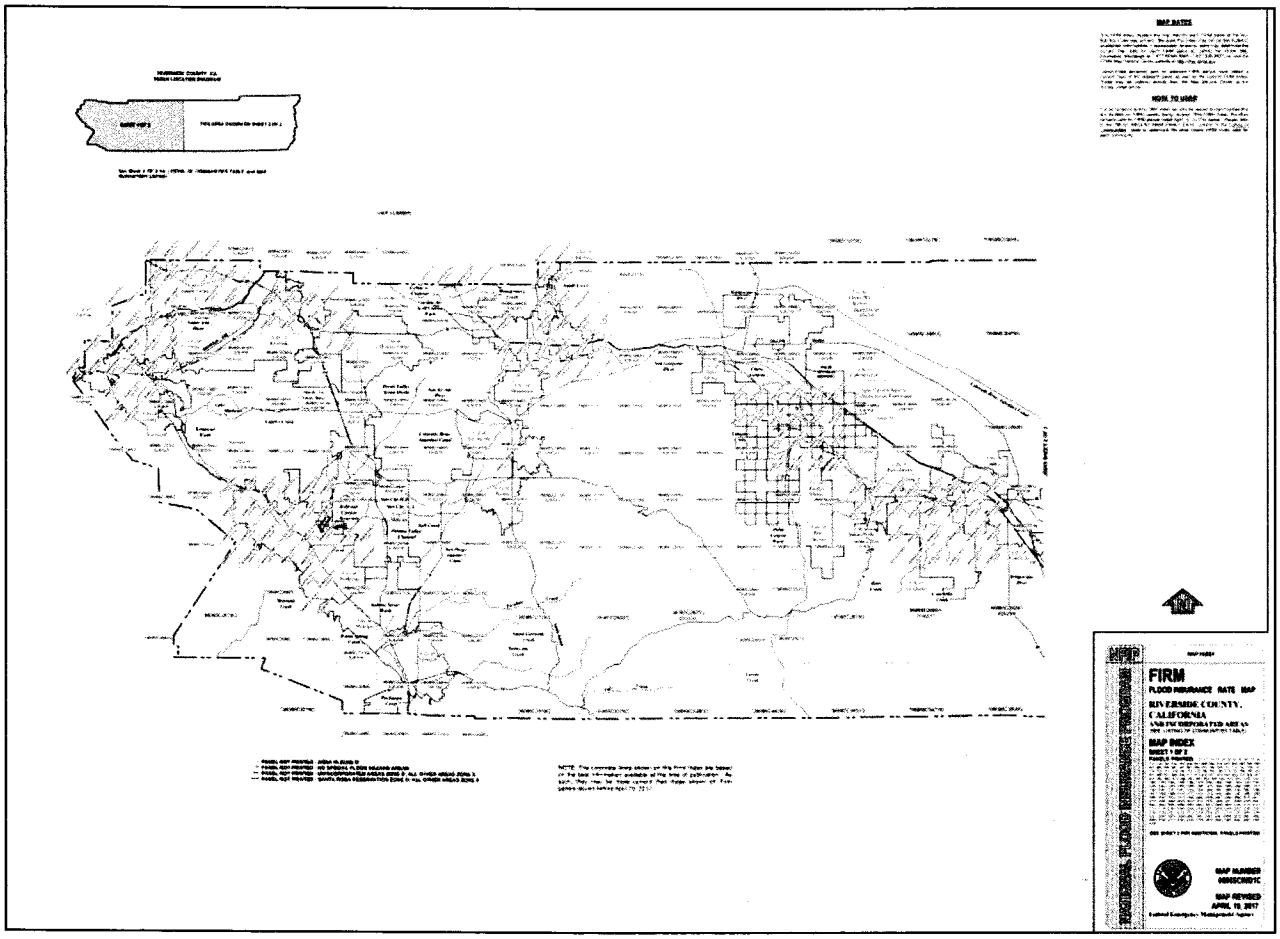
Riverside County utilizes several sources to determine local flood hazards: FEMA Flood Insurance Rate Maps, DWR Awareness Maps, and local flood zone delineation maps as identified in Riverside County Ordinance 458 (updated 6/9/2017). For floodplain management purposes, the County regulates unincorporated development within each of the above maps. Each of the incorporated Cities administers its own floodplain management program and may or may not utilize floodplain information beyond that provided by FEMA's Flood Insurance Rate Maps.

FEMA Flood Insurance Rate Mapping

FEMA updated the Digital Flood Insurance Rate Maps (DFIRMS) effective range from August 28, 2008, to April 19, 2017, depending on when jurisdictions requested maps to be updated. The DFIRMS are available for public viewing from FEMA's website:

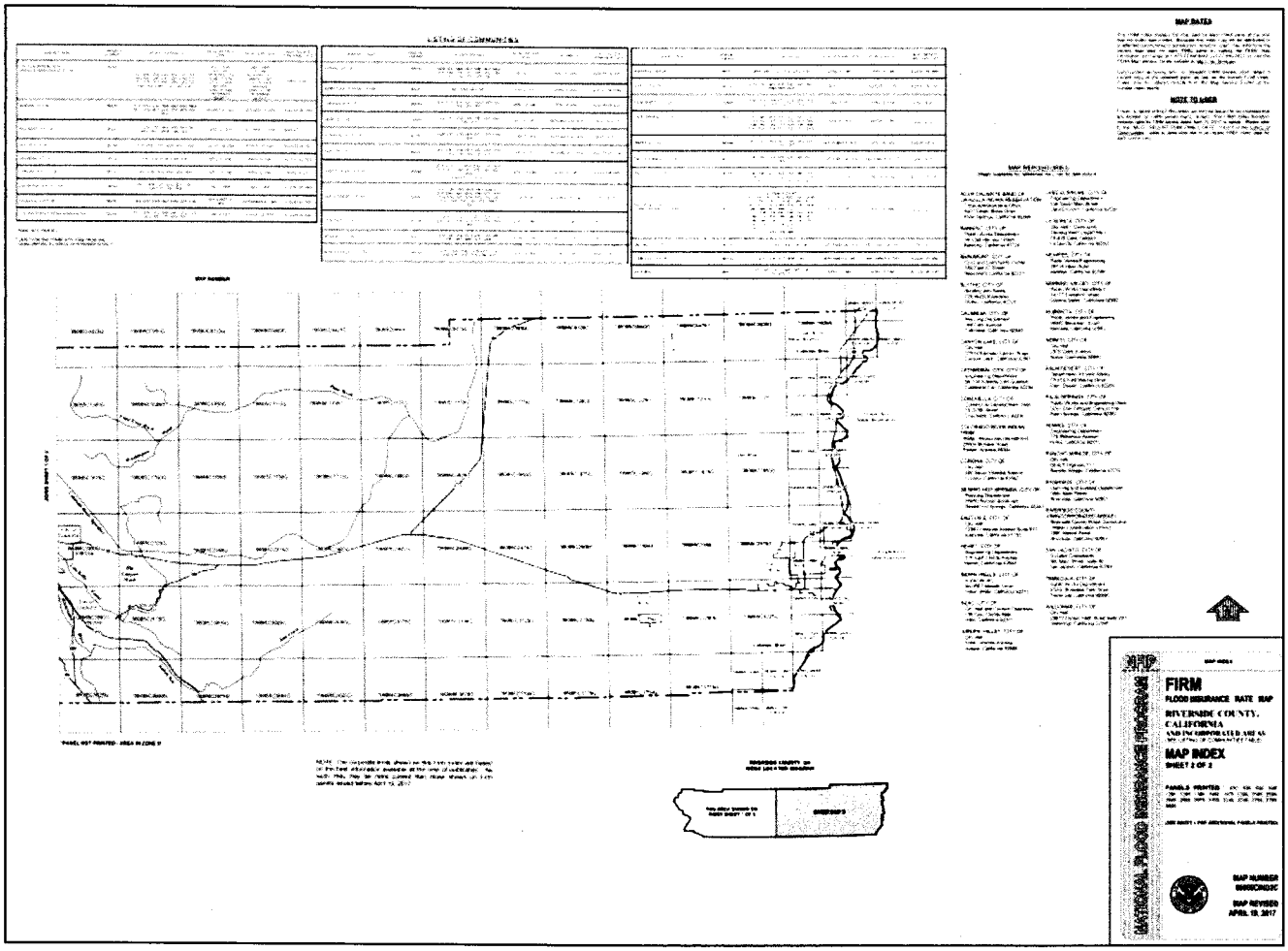
Source: http://msc.fema.gov/portal/advanceSearch#searchresultsanchor

Map 29: FEMA FIRM Map 2017 – West County



Source: http://msc.fema.gov/portal/advanceSearch#searchresultsanchor

Map 30: FEMA FIRM Map 2017 – East County



Source: http://msc.fema.gov/portal/advanceSearch#searchresultsanchor

Table 26: FIRM Flood Zones

Zone	Description
A	Area with a 1% annual chance of flooding. No depths or Base Flood Elevations (BFEs) are shown.
AE	Base floodplain where BFEs are provided. AE Zones are now used on digital FIRMs instead of A1 - A30 Zones.
A1 through 30	Known as numbered A Zones, these are the base floodplains in the old FIRM format where a BFE is shown.
AH	Area with a 1% annual chance of shallow flooding with an average depth ranging from 1 to 3 feet. BFEs are shown at selected intervals.
AO	River or stream flood hazard area, or area with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow with an average depth ranging from 1 to 3 feet. Average flood depths derived from detailed analyses are shown.
AR	Area with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam).
A99	Area with a 1% annual chance of flooding protected by a federal flood control system where construction has reached specified legal requirements. No depths or BFEs are shown.
V	Coastal area with a 1% or greater chance of flooding and an additional hazard associated with storm waves. No BFEs are shown within these zones.
VE or V1 through 30	Coastal area with a 1% or greater chance of flooding and an additional hazard associated with storm waves. BFEs are shown at selected intervals.
B, C, X	Zones considered having moderate to low risk of flooding, although flood insurance is available to property owners and renters in communities that participate in the NFIP.
D	Area with possible but undetermined flood hazards, where no flood hazard analysis has been conducted.

FEMA also conducted a Flood Insurance Study and determined that the following areas have the potential to flood.

Figure 35: Flood Insurance Study Areas

Water Source Studied	Water Source Studied	Water Source Studied
Acacia Creek Drain	Lincoln Avenue Drain	San Sevaine Channel
Alessandro Wash	Little Morongo Wash	Santa Ana River
All American Canal	Long Canyon Wash	Sheet Flow along Ocotillo Road
Arlington Canal	Macomber Palms Channel	Smith Creek
Arroyo Del Toro	Magnesia Falls Road	Smith Creek West Tributary
Bear Creek	Magnesia Springs Channel	South Norco Channel and Trib.s A and B
Beaumont Chanel	Main Street Drain	Spring Brook
Bedford Canyon Wash	Mangular Channel	Spring Brook Wash
Big Morongo Wash	Marshall Creek	Stetson Avenue Channel
Biskra Palms Channel	McVicker Canyon Wash	Stovepipe Canyon Creek
Blind Canyon Channel	Metz Road Basin	Stream A (Vicinity of Des. Hot Springs)
Bly Channel	Mirage Indian Trail Wash	Sun City Channels A-A, C-C, H-H and X-X
Box Springs Wash	Mission Creek	Sun City Southeast Tributary
Calimesa Channel	Mockingbird Canyon Wash	Sunny Slope Channel
Carrizo Alluvial Fan	Montgomery Creek	Sunnymead Storm Channel
Channel H	Mountain Avenue Wash	Taylor Avenue Drain
Cherry Avenue Channel	Murrieta Creek	Temecula Creek
Coachella Valley Stormwater Channel	North Cathedral Channel	Temescal Wash
Country Club Creek and North Tributary	North Norco Channel and Trib.s A, B and C	Tequesquite Arroyo
Day Creek Santa Ana River	North Palm Springs Wash	The Veldt
Dead Indian Alluvial Fan	North Side Wolf Valley Creek	Third Street Basin
Deep Canyon Alluvial Fan	Oak Street Channel	Thousand Palms Canyon Wash
Deep Canyon Storm Water Channel	Ocotillo Drive Wash	Thousand Palms Main Channel
Desert Hot Springs Channel	Orange Lateral	Thousand Palms Tributaries A, B and C
Dunes View Road Channel	Ortega Wash	Thunderbird Wash
Dry Morongo Wash	Ortega Channel	Tramview Wash
East Cathedral Channel	Palm Canyon Wash	Tramview Wash Tributary
East Gilman Home Channel	Palm Valley Drain	University Wash
East Rancho Mirage Storm Channel	Park Hill Drain	Wash G
El Cerrito Channel	Pechanga Creek	Wash I
Elsinore Spillway Channel	Perris Valley Storm Drain	Wasson Canyon Creek
Garden Air Gold Course Wash	Pigeon Pass Channel	West Cathedral Channel
Gilman Home Channel	Prenda Wash	West Norco Channel
Harrison Wash	Pushawalla Canyon Wash	West Pershing Channel
Hemet Storm Channel	Pyrite Channel	Whitewater River
Highland Springs Channel	Rache Channel	Whitewater River (C.V.S.C.)
Interstate-10 Wash	Ramsey Street Drain	Whittier Avenue Channel
Kalmia Street Wash	Rice Canyon Wash	Woodcrest Wash
Lake Elsinore	Salt Creek and Tributary	Unnamed Stream A
Lakeland Village Channel	Salt Creek Overflow	Unnamed Stream B
Lakeview Wash	San Gorgonio River	Unnamed Stream C
Leach Canyon Channel	San Jacinto River	1001 Ranch Drain
Lime Street Channel	San Jacinto Lateral	1001 Ranch Drain West Tributary

DWR Awareness Floodplain Mapping

The intent of the California Department of Water Resources (DWR) Awareness Floodplain Mapping project was to identify all pertinent flood hazard areas by 2015 for areas that are not mapped under the FEMA National Flood Insurance Program (NFIP) and to provide the community and residents an additional tool in understanding potential flood hazards currently not mapped as a regulated floodplain. The awareness maps identify the 100-year flood hazard areas using approximate assessment procedures. These floodplains are shown as flood-prone areas without specific depths and other flood hazard data. Awareness Floodplain Maps were incorporated into County Ordinance 458.

The maps that were originally adopted are available on the DWR website. DWR will not be modifying these maps since it was a one-time project. As development occurs and the floodplains change due to channelization, the floodplain limits of the Awareness floodplains are being updated by Riverside County Flood Control (RCFC) and will be reflected on the RCFC interactive maps found at:

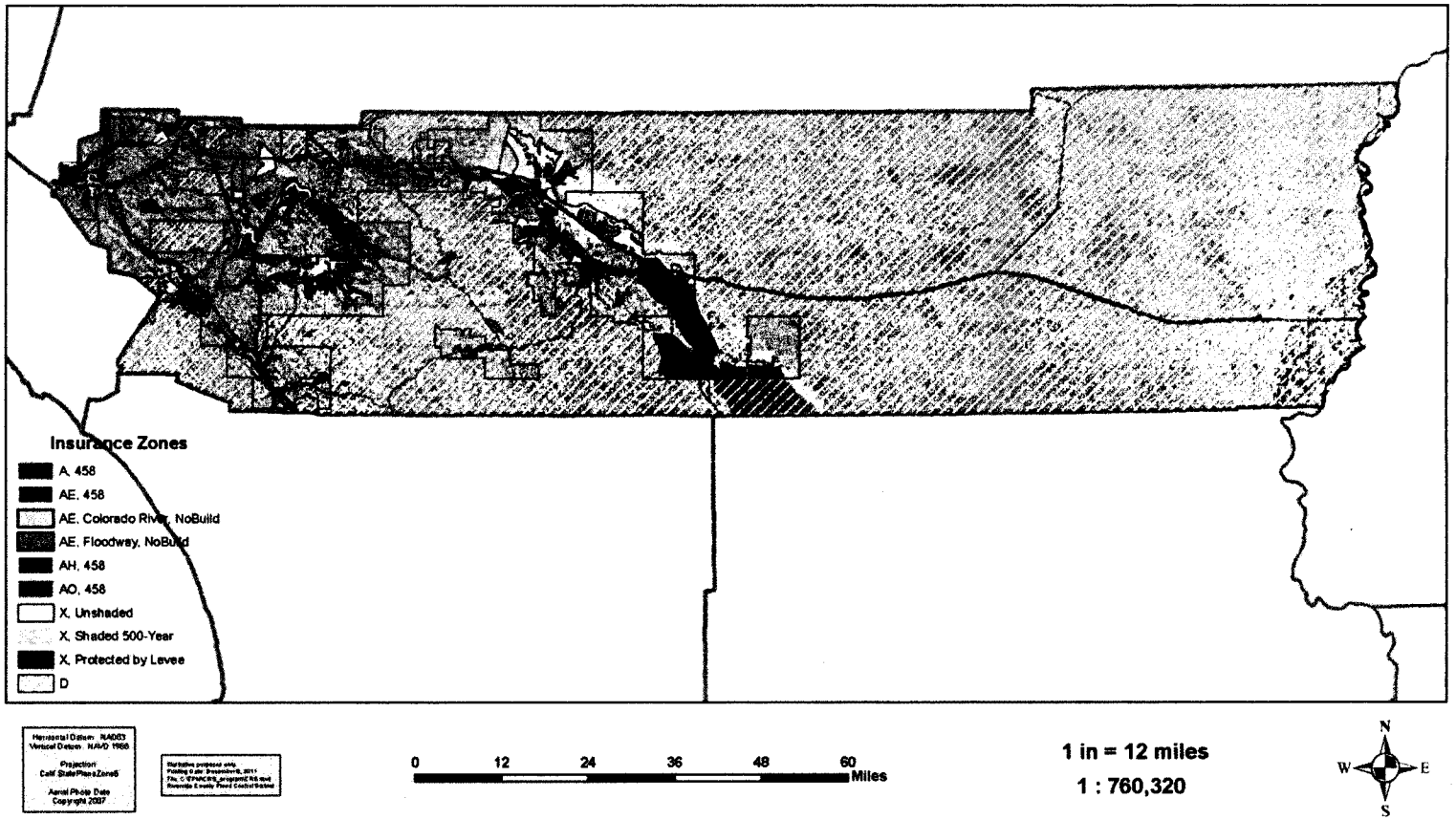
http://rcflood.org/FloodDetermination/FloodDetermination_V09.aspx

California Department of Water Resources Awareness Floodplain Maps can be found at http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/awareness_floodplain_maps/

Map 31: FEMA Flood Insurance Rate Map

Riverside County Flood Control District

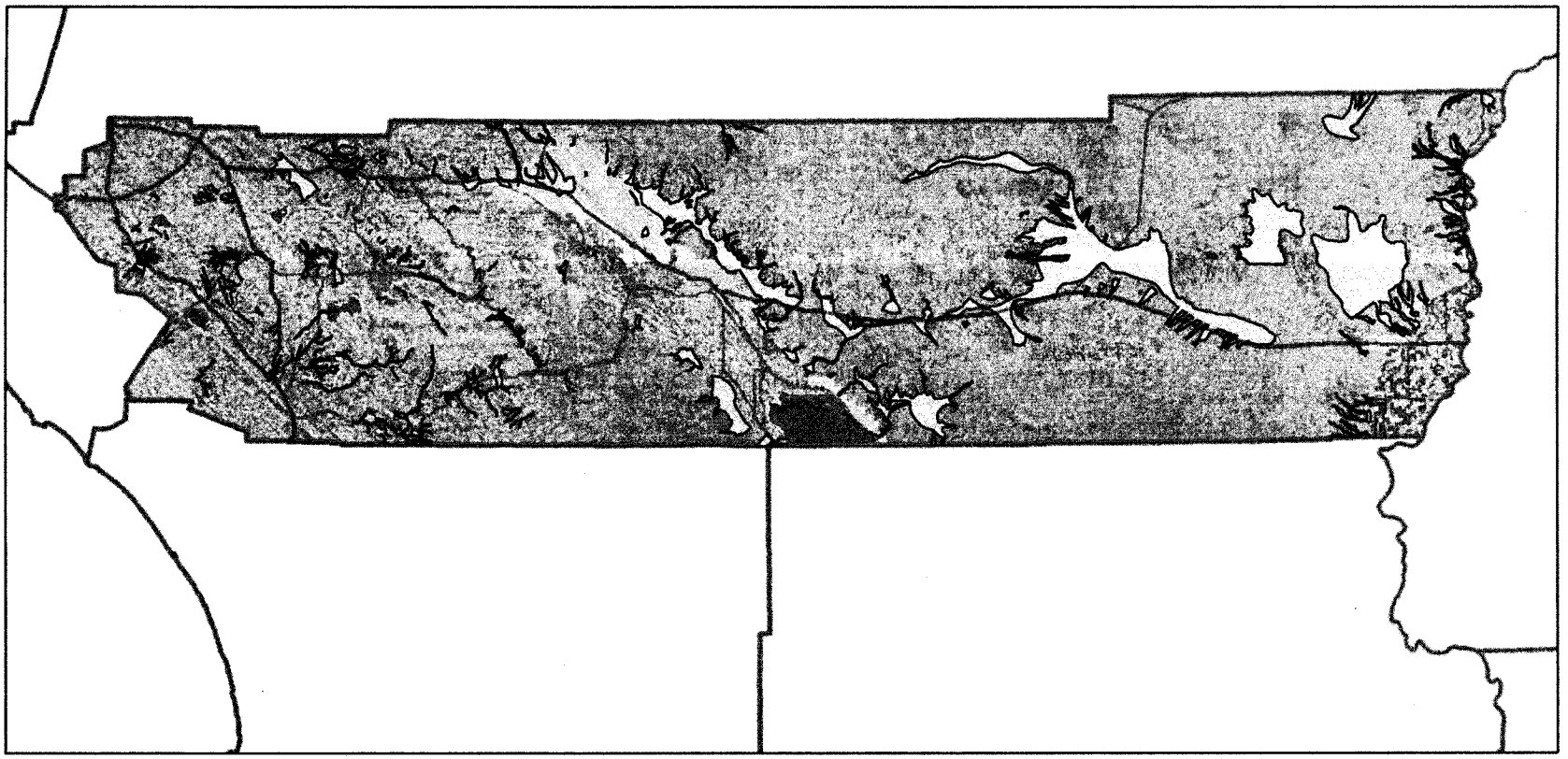
FEMA Flood Insurance Rate Map



Map 32: DWR Awareness Floodplain Map

Riverside County Flood Control District

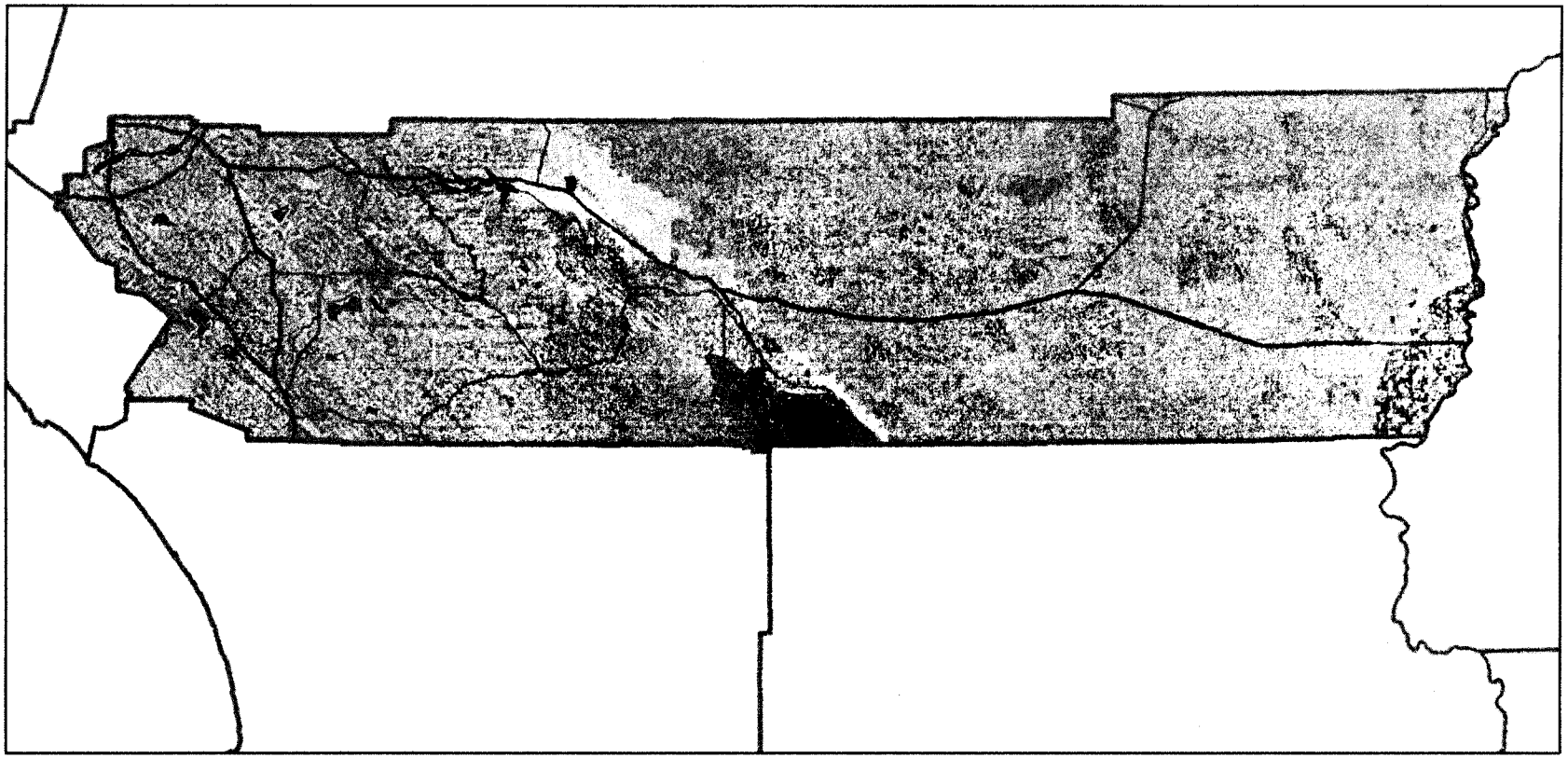
DWR Awareness Floodplain Map



Map 33: Local Studies Floodplain Map

Riverside County Flood Control District

Local Studies Floodplain Map



Risk Assessment

As stated in the State of California Multi-Hazard Mitigation Plan, Riverside County has 27 declared flood disasters from the period of 1950 – December 2012. The total can be updated to 29 when adding the two flood disaster declarations in 2015 and 2017. The State's plan also shows Riverside County has a population of 295,081 living within FIRM-Designated Floodplains (based on 2000 Census Data). According to the 2017 Southern California Association of Governments (SCAG) Unincorporated Area of Riverside County Report, the number of residents living in the unincorporated area has increased to 364,413.

HAZUS was used to generate general building stock and essential facility loss estimates for three different floods in the County – a 1% annual chance flood event (100-year flood) with the existing certified levee system in the County intact, a 1% annual chance flood event without consideration of these levees, and a 500-year (0.2% chance per year) flood. Flood hazard data from DFIRM maps available at FEMA's Map Service Center were used to develop the flood scenarios.

Table 27: Summary of HAZUS – Estimated Impacts on Riverside County for Three Flood Scenarios

Impact Category	100-Year	100-Year w/o Levee	500-Year
Economic Loss due to Building Damage, Total Building-related Direct	$0.81 B $1.7 B	$2.3 B $4.9 B	$3.6 B $7.8 B
# Buildings in Complete Damage State	1,356	3,655	6,262
Debris Generated (million tons)	0.20	0.50	0.78
Displaced Households, People Needing Short- term Shelter	16,896 41,846	79,078 223,787	125,887 357,092
# Highway Bridges w/ at least Moderate Damage (potentially closed)	0 (of 4 damaged)	0 (of 4 damaged)	0 (of 4 damaged)

Table 28: Summary of HAZUS – Estimated Impacts for Riverside County Essential Facilities in Three Flood Scenarios

Essential Facility	Category	100-Year		100-Year w/o Levee		500-Year	
		Time to Restore (Days)	Economic Loss ($1,000)	Time to Restore (Days)	Economic Loss ($1,000)	Time to Restore (Days)	Economic Loss ($1,000)
Hospitals*	Medium	0	$0	540	$0	540	$0
	Large	0	$0	540	$0	360-540	$0
Schools	K-12 (default data)	480	$115	480	$865	480	$2,232
	K-12 (providing data)	360-720	$12,482	360-720	$38,838	360-720	$66,911
	CCD (providing data)	0	$0	360-480	$6,285	360-480	$6,285
EOCs		0	$0	480	$560	360-480	$5,113
Police Stations		480	$0	360-480	$0	360-480	$796
Fire Stations		480	$692	360-480	$692	360-630	$1,994
TOTALS		**360-720**	**$13,289**	**360-720**	**$47,240**	**360-720**	**$83,331**

*Note: In Riverside County, there are no hospitals which would be categorized by HAZUS as "Small" (<50 licensed acute care beds)

- **Effects on People and Housing:** Of the approximately 647,000 buildings modeled within the general building stock for Riverside County, about 1% (6,262) are expected to suffer "complete" damage in the 0.2% annual chance flood event (500-year flood) scenario. These building would be considered "red-tagged" or unsafe for continued occupancy. About 94% of the 6,262 buildings are manufactured housing (i.e., mobile homes). Approximately 43,000 buildings (6.6%) are expected to suffer more than 20% damage or more while about 18,000 buildings are estimated to suffer flood damage of less than 20%. As much as 0.78 million tons of debris may result from these damaged buildings – 21% is expected to be heavy debris (concrete and steel), requiring heavy equipment to break down and remove, while 79% is expected to be light debris (wood, brick, drywall and other debris).

Damage to single family and multi-family dwellings is expected to result in the displacement of almost 126,000 households. While many of the displaced may find shelter with friends and family, or in available hotels, as many as 357,000 people are expected to seek short-term public shelter. This large number of people would likely overwhelm the emergency sheltering capacity of the county. The displaced populace should be able to move to safe locations without too much difficulty. While four (4) bridges in the county's transportation system are expected to suffer minor flood damage, the bridges are expected to remain functional.

- **Essential Facility Impacts:** Table 29 provides an overview of essential facility performance in the 0.2% annual chance flood event (500-year flood) with levees scenario. The table lists the number of essential facility sites and buildings (these numbers will differ for multi-building campuses, such as schools and hospitals). The table also provides the total building replacement value, and the number of buildings for which value data was available. As can be seen in the table, replacement cost data for hospitals was generally not available, unlike most other essential facility types. Expected building damage in this flooding event ranges from 0% damage for numerous essential facility types with some, but minimal, flooding, to as much as 7.1% mean damage for one school district. The total economic loss for essential facilities has been estimated to reach about $83 million, almost 91% of which ($75 million) will occur in schools and about 6% of which will occur in EOCs ($5.1 million). It should be noted that no hospital losses were estimated since all hospitals impacted by this flooding scenario did not provide replacement value data. (The full economic impact on hospitals can't be estimated at this time because of the lack of comprehensive replacement value data).

Table 29: Riverside County Essential Facility Loss Estimates – 0.2% Annual Chance Flood Scenario

Essential Facility	Category	No. of Facilities/Sites	No. of Buildings	No. of Beds	Replacement Cost ($1,000)	# Buildings w/ replacement	# Non-Functional Buildings	Time to Restore (Days)	Economic Loss ($1,000)
Hospitals*	Medium	8	28	793	$162,827	21	0	540	$0
	Large	8	49	2,467	$200,792	10	0	360-540	$0
Schools	K-12 (default data)	152	152		$219,600	152	31	480	$2,232
	K-12 (providing data)	689	9,981		$6,049,534	9,213	1,111	360-720	$66,911
	CCD (providing data)	12	258		$356,708	257	92	360-480	$6,285
EOCs		43	43		$310,273	43	4	360-480	$5,113
Police Stations		51	51		$675,299	48	2	360-480	$796
Fire Stations		156	156		$366,493	156	8	360-630	$1,994
TOTALS		**1,119**	**10,718**	**3,260**	**$8,341,525**	**9,900**	**1,248**	**360-720**	**$83,331**

Note: In Riverside County, there are no hospitals which would be categorized by HAZUS as "Small" (<50 licensed acute care beds)