SECTION IV-B EARTHQUAKE

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Part IV-B Earthquake

A. Overview

Earthquakes are considered a major threat to Orange County, California due to the proximity of several fault zones, including: the San Joaquin Hills, Newport-Inglewood/Rose Canyon, Whittier, San Andreas and the little known El Modeno Fault. In March 2015. Southern California Earthquake Center reported that a Magnitude 7+ has a 75% chance of occurrence in the next 30 years. A significant earthquake along one of the major faults could cause substantial casualties, extensive damage to buildings, roads and bridges, fires, and other threats to life and property. The effects could be aggravated by aftershocks and by secondary effects such as fire, landslides and dam failure. A major earthquake could be catastrophic in its effect on the population, and could exceed the response capability of the district, the local communities and even the State of California.

Japan's 2011 earthquake demonstrates how damaging earthquakes can be to a population in a built environment. It also graphically demonstrates the catastrophic secondary hazards caused by earthquakes such as tsunamis, landslides, fires and nuclear power plant melt-downs. This is why FEMA, the State of California, Orange County and the Rancho Santiago Community College District (RSCCD) have worked together to make earthquake mitigation a priority.

B. California Earthquake Vulnerability

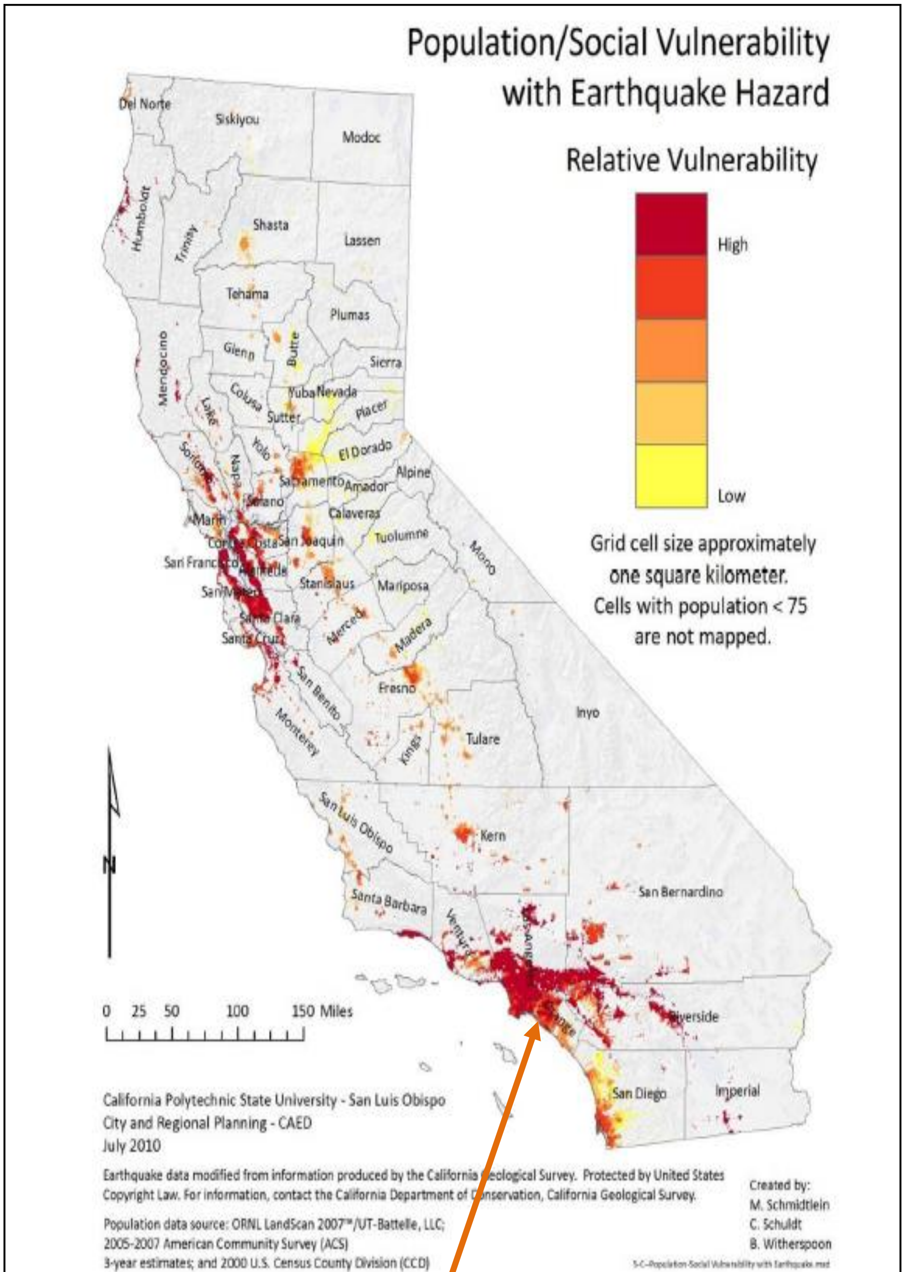
The following risk assessment map identifies which areas within California's 58 counties are particularly vulnerable to earthquakes, whether due to high population density or because of higher numbers of socially vulnerable residents. In addition to completion of the population/ social vulnerability mapping, this GIS risk assessment addresses where people live in relation to earthquakes. Areas of the state with low population density have relatively low risk compared to areas with high population density or areas with medium density and high percentages of vulnerable population.

As of the 2010 U.S. Census, the Los Angeles Metropolitan Statistical Area had a population of nearly **13 million residents**. Meanwhile, the larger metropolitan region's 2014 population estimate is **about 18.5 million** people (includes Orange County).

When a major earthquake strikes anywhere in the Los Angeles metropolitan region, the impact on the millions of individuals, families, small businesses and businesses with hazardous chemicals, transportation systems, utilities, infrastructure, public agencies, schools, hospitals, and the economy can be catastrophic, causing perhaps the worst natural disaster in the United States history.

This map uses combined "social vulnerability" factors, such as age, income, disability, education, ethnicity, gender and other variables which may reduce individual disaster resiliency.

FIGURE 1: CALIFORNIA POPULATION/SOCIAL VULNERABILITY EARTHQUAKE HAZARD



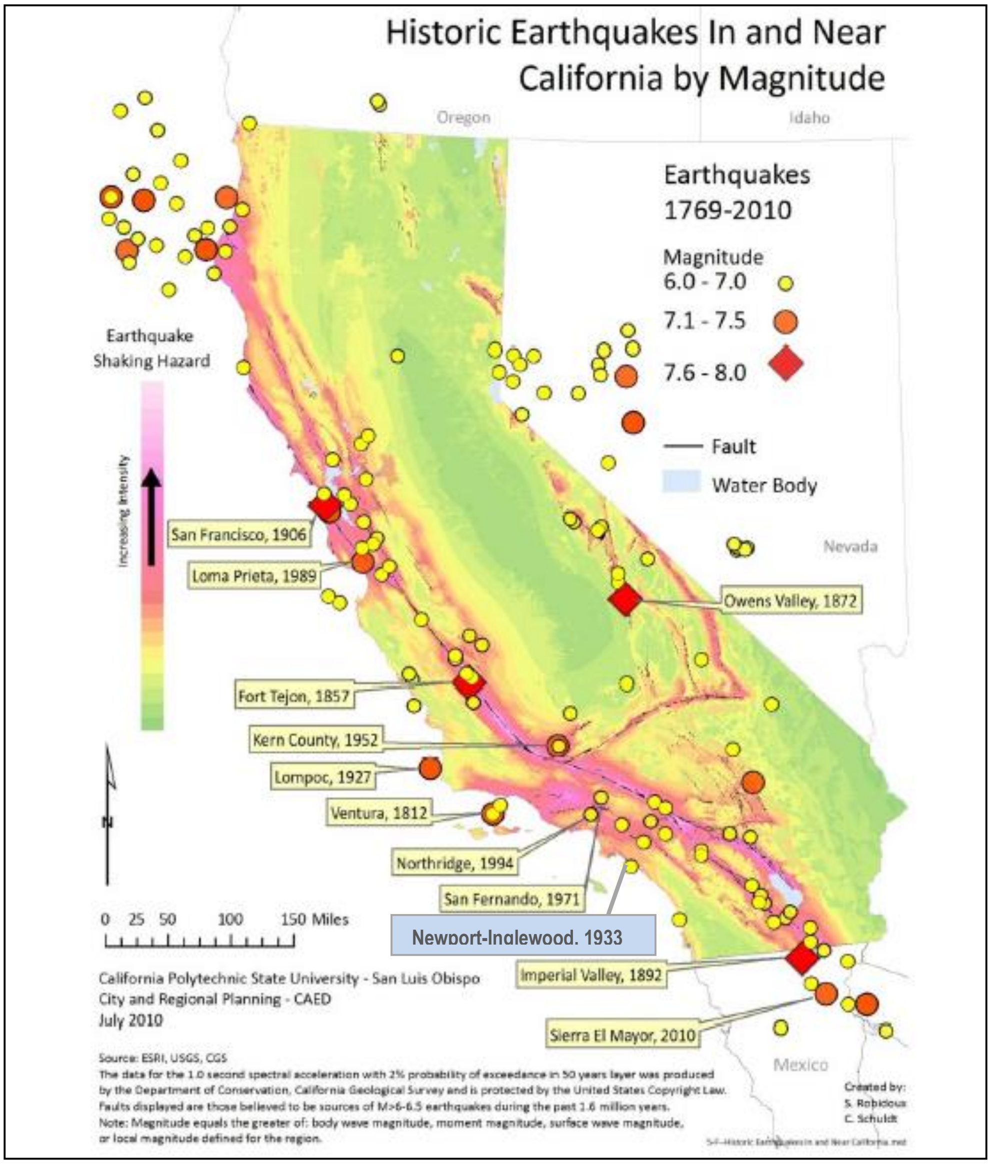
Map 5.C shows population/social vulnerability in areas at high risk to earthquake hazards. Greatest concentrations are in Southern California and the San Francisco Bay area.

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

The RSCCD is located in an area that is between the highest and high rankings.

The following map shows the ***Historic Earthquakes in and Near California by Magnitude***. Note the Newport-Inglewood fault in 1933 (name added to the map in blue). This 6.4 magnitude earthquake's epicenter was in Huntington Beach/Huntington Harbour area. This quake devastated the closest built-out area, which at the time was Long Beach, where 120 deaths occurred and hundreds of buildings collapsed, mostly buildings made of unreinforced masonry.

FIGURE 2: CALIFORNIA AREAS DAMAGED BY EARTHQUAKE FROM 1800 – 2007

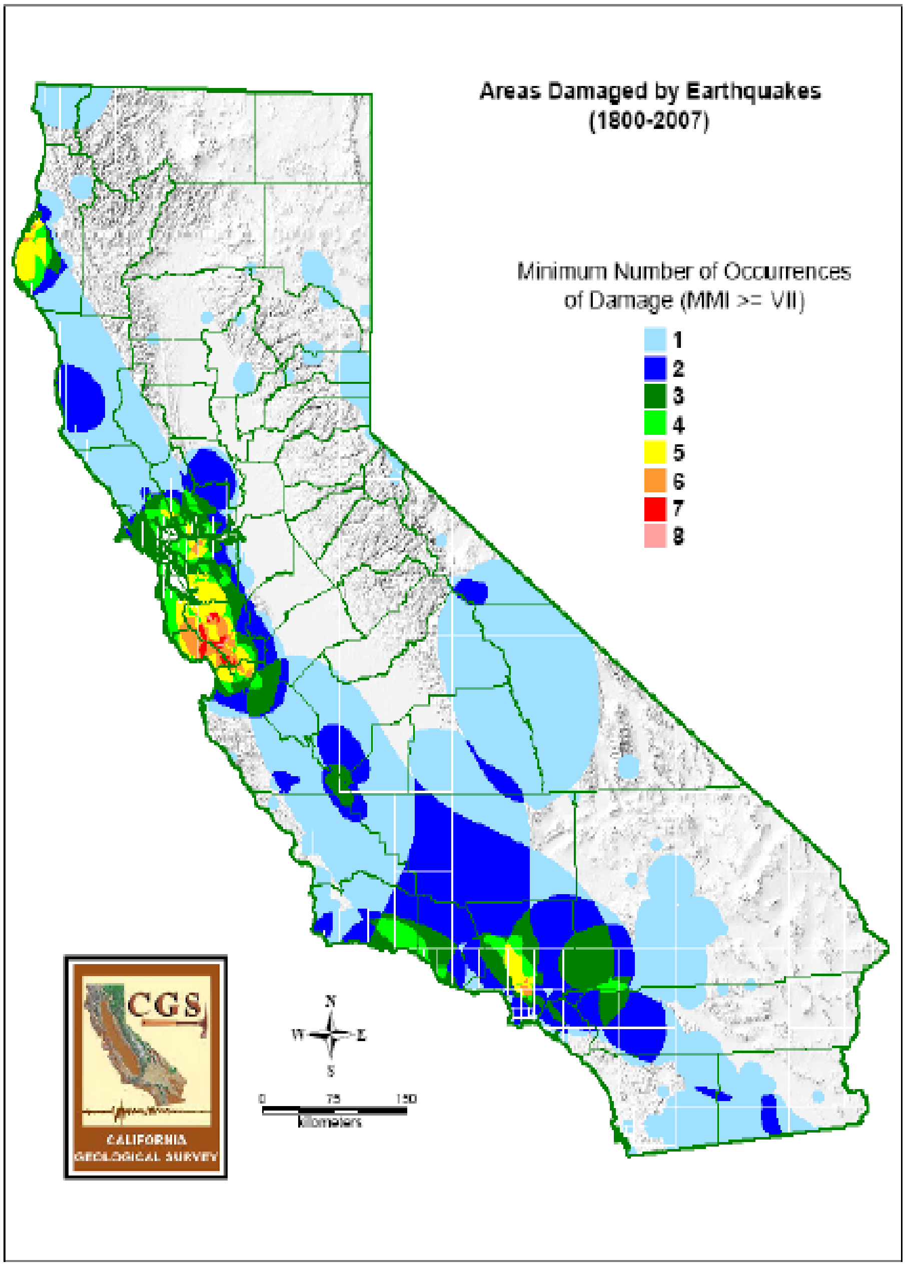


STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

AREAS DAMAGED BY EARTHQUAKES

Below is the map depicting the areas damaged by earthquakes from 1800 to 2007.

FIGURE 3: AREAS DAMAGED BY EARTHQUAKES (1800-2007)



Orange County has proclaimed Local Emergencies and been part of two State and Federally Declared Earthquake Disasters since 1950. These were for the:

1987 Whittier Earthquake
- 6.0 magnitude
- 9 deaths
- 200+ injuries
- $522 million total damage

1994 Northridge Earthquake
- 6.7 magnitude
- 57 deaths
- 11,846 injuries
- $46 billion total damage

Below in Table 1 is a list of California earthquakes from 1971 to 2003. It includes the earthquake magnitude, direct dollar losses in millions, deaths and injuries as the result of these earthquakes.

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

TABLE 1: EARTHQUAKE LOSSES FOR CALIFORNIA 1971 TO 2003

Earthquake	Date	Magnitude	Direct Losses[a]	Deaths[d]	Injuries[d]
San Fernando	February 9, 1971	6.6	$2,200[b]	58	2000
Imperial Valley	October 15, 1979	6.5	$70[b]	0	91
Coalinga	May 2, 1983	6.4	$18[b]	1	47
Whittier Narrows	October 1, 1987	6.0	$522[c]	9	200+
Loma Prieta	October 17 1989	6.9	$10,000[d]	63	3757
Cape Mendocino	April 25, 1992	7.0	$80[c]	0	356
Landers/Big Bear	June 28, 1992	7.3	$120[c]	1	402
Northridge	January 17, 1994	6.7	$46,000[b]	57	11,846
Hector Mine	October 16, 1999	7.1		0	11
San Simeon	December 22, 2003	6.5	$263[e]	2	46

[a]*Estimate in millions of dollars*
[b]*FEMA, 1997; U.S Office of Technology Assessment*
[c]*National Research Council, 1994*
[d]*Cal EMA*

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

CALIFORNIA AND EARTHQUAKE MITIGATION EXPENDITURES

The State of California has made earthquake hazard mitigation a priority. The following table summarizes the dollar amount spent on selected earthquake mitigation projects in Californa from 1990 – 2010. *Unfortunately*, there has been little state dollars dedicated to community colleges. To date, $9 million has been spent on Community College Seismic Evaluation Surveys by the state. Most of the progress of Community Colleges has been due to locally passed bond measures.

TABLE 2: CALIFORNIA ESTIMATED EXPENDITURES ON EARTHQUAKE MITIGATION

Program or Project	Expenditures (in Millions)
Caltrans Bridge Retrofit, Replacement and Toll Bridge Program	$11,120
Bridge Retrofit by Local Governments	$1,196
Caltrans Earthquake Research	$90
Proposition 122 State Building Retrofits	$223.5
Local Government Essential Services Building Retrofits	$45.4
Technology Development	$3
AB 300 Public School Survey	$.5
Alquist Act Hospital Evaluation and Retrofit Program	$11
Cal EMA/DSA Nonstructural Pamphlet for Schools	$.05
Cal EMA Hazard Mitigation Program (HMGP)	$70
Division of the State Architect K-12 School Seismic Hazard and Retrofit/Design*	$1,550
Community College Seismic Evaluation Survey	$.9
UC Berkeley SAFER Program	$250
CSU Seismic Retrofit Program	$300
UC Seismic Retrofit Program	$2,600
Department of Insurance Retrofit Grants Program	$6.4
Pacific Earthquake Engineering Research Center	$20
PUC/CEC Earthquake Research	$5.5
TriNet/CISN	$13.8
DWR Levee Study in the Delta	$2.3
State Lands Commission Marine Oil Terminal Project	$.1
CAL EMA New State Operations Center	$26.5
Seismic Instrument Operation (DWR)	$6
Water Project Review (DWR)	$7
Division of Safety of Dams (DWR)	$5
OPR	$225
PUC	$.6
CSSC	$10
Seismic Hazard Mapping Program	$32
UC Seismographic Station and Research Center	$23
BART Retrofit Program	$28
CEA Mitigation Program	$5
Strong Motion Instrument Program	$45
Hospital Seismic Hazard mitigation 1989-2002 (all California hospitals)	$7,120
City of Los Angeles ATC 50 Residential Grading Plan	$1
San Francisco Bond Measure for URM Retrofits	$350
URM Building Seismic Retrofits	$1,730
San Francisco Community Action Plan for Seismic Safety	$7
Los Angeles Historic Property Contracts Retrofit Program	2.5
East Side Reservoir Project (Lost Angeles)	$2,000
Local Match for FEMA Post-Northridge Earthquake Seismic Hazard Mitigation	$249.7
Total	$18,970.6

NOTE: Includes possible errors due to rounding.
** 1990-2002 only*

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

RSCCD was included in the California Seismic Survey Report, April 1998. Six RSCCD buildings were on the list as recommended seismic upgrades. Five of those building have been either demolished or retrofitted. The sixth is scheduled for demolition in 2016.

EARTHQUAKE COMMUNITY IMPACTS

Following major earthquakes, extensive search and rescue operations may be required to assist trapped or injured persons. Emergency medical care, food and temporary shelter would be required for injured or displaced persons. Fires may rage out of control. In the event of a truly catastrophic earthquake, identification and burial of the dead would pose difficult problems. Mass evacuation may be essential to save lives, particularly in areas below dams and around nuclear power plants. Many families could be separated, particularly if the earthquake should occur during working/school hours, and a personal inquiry or locator system would be essential. Emergency operations could be seriously hampered by the loss of communications and damage to transportation routes within, to and out of the disaster area and by the disruption of public utilities and public safety services.

Extensive state and federal assistance could be required and could continue for an extended period. Efforts would be required to remove debris and clear roadways; demolish unsafe structures; assist in reestablishing public services and utilities; and provide continuing care and welfare for the affected population including temporary housing for displaced persons.

In general, the population is less at risk during non-work hours (if at home) as wood-frame structures are relatively less vulnerable to major structural damage than are typical commercial and industrial buildings. Transportation problems are intensified if an earthquake occurs during work hours, as significant numbers of Orange County residents commute to work in/out of Los Angeles County. Thousands also commute to and from Riverside County. An earthquake occurring during work hours would clearly create major transportation problems for those displaced workers.

Hazardous materials could present a major problem in the event of an earthquake. Orange County, one of the largest industrial and manufacturing areas in the state, has several thousand firms that handle hazardous materials, and are estimated to produce more than 100 million gallons of hazardous waste per year. The County’s highways serve as hazardous materials transportation corridors, and Interstate 5 is the third busiest highway corridor in the country.

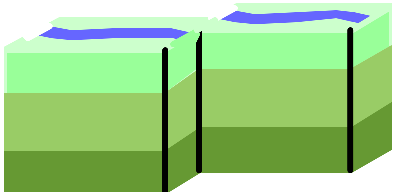
Much of the industrial base of Southern California, and Orange County in particular, consists of high-technology and bio-technology companies essential to the Nation's commerce, economy, and defense effort. A catastrophic earthquake could not only have a severe impact on the local industrial base; but also a major impact on the security of our nation. For example, Census and Department of Defense data indicate that over 50 percent of the U.S. Missile and Space Vehicle business, about 75 percent of the domestic micro-chip industry, 40 percent of the U.S. semiconductor business, and more than 20% of the U.S. optical instrument business is located in California. Much of that capacity, including prime contractors, subcontractors or supply vendors, is located in Orange County. Approximately 5,000 defense contractors are located within 50 miles of the San Andreas Fault -- including virtually all of Orange and Los Angeles Counties. In some cases, local defense contractors are the only source for some of the most critical defense systems used by our military departments.

In addition to the loss of production capabilities, the economic impact on the County from a major earthquake would be considerable in terms of loss of employment and loss of tax base. Also, a major earthquake could cause serious damage and/or outage to computer facilities. The loss of such facilities could curtail or seriously disrupt the operations of banks, insurance companies, and other elements of the financial community. In turn, this could affect the ability of local government, business and the population to make payments and purchases.

CAUSES AND CHARACTERISTICS OF EARTHQUAKES

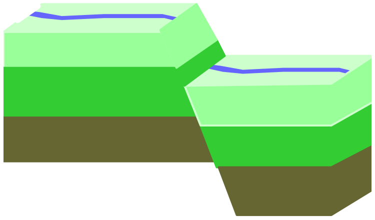
EARTHQUAKE FAULTS

A fault is a fracture along or between blocks of the earth's crust where either side moves relative to the other along a parallel plane to the fracture.



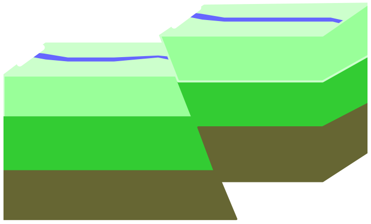
STRIKE-SLIP

Strike-slip faults are vertical or almost vertical rifts where the earth's plates move mostly horizontally. From the observer's perspective, if the opposite block looking across the fault moves to the right, the slip style is called a right lateral fault; if the block moves left, the shift is called a left lateral fault.



DIP-SLIP

Dip-slip faults are slanted fractures where the blocks mostly shift vertically. If the earth above an inclined fault moves down, the fault is called a normal fault, but when the rock above the fault moves up, the fault is called a reverse fault. Thrust faults have a reverse fault with a dip of 45 ° or less.



STRUCTURAL CODES IMPROVEMENTS

The 1933 Long Beach earthquake resulted in the Field Act, mandating improved building codes for school construction. The 1971 Sylmar earthquake brought another set of increased structural standards for hospitals. Similar re-evaluations occurred after the 1989 Loma Prieta and 1994 Northridge earthquakes on steel framed high rise construction. These code changes have resulted in stronger and more earthquake resistant structures.

TABLE 3: MODIFIED MERCALLI INTENSITY (MMI) SCALE (RICHTER, 1958)

The **Mercalli** intensity **scale** is a seismic **scale** used for measuring the intensity of an earthquake. It measures the effects of an earthquake.

Value	Description
I	Not felt. Marginal and long period effects of large earthquakes.
II	Felt by persons at rest, on upper floors, or favorably placed.
III	Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV	Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motorcars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frame creak.
V	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.
VI	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church, school). Trees, bushes shaken (visibly, or heard to rustle)
VII	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
VIII	Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.
X	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI	Rails bent greatly. Underground pipelines completely out of service.
XII	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

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

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

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

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

C. ORANGE COUNTY EARTHQUAKE THREAT

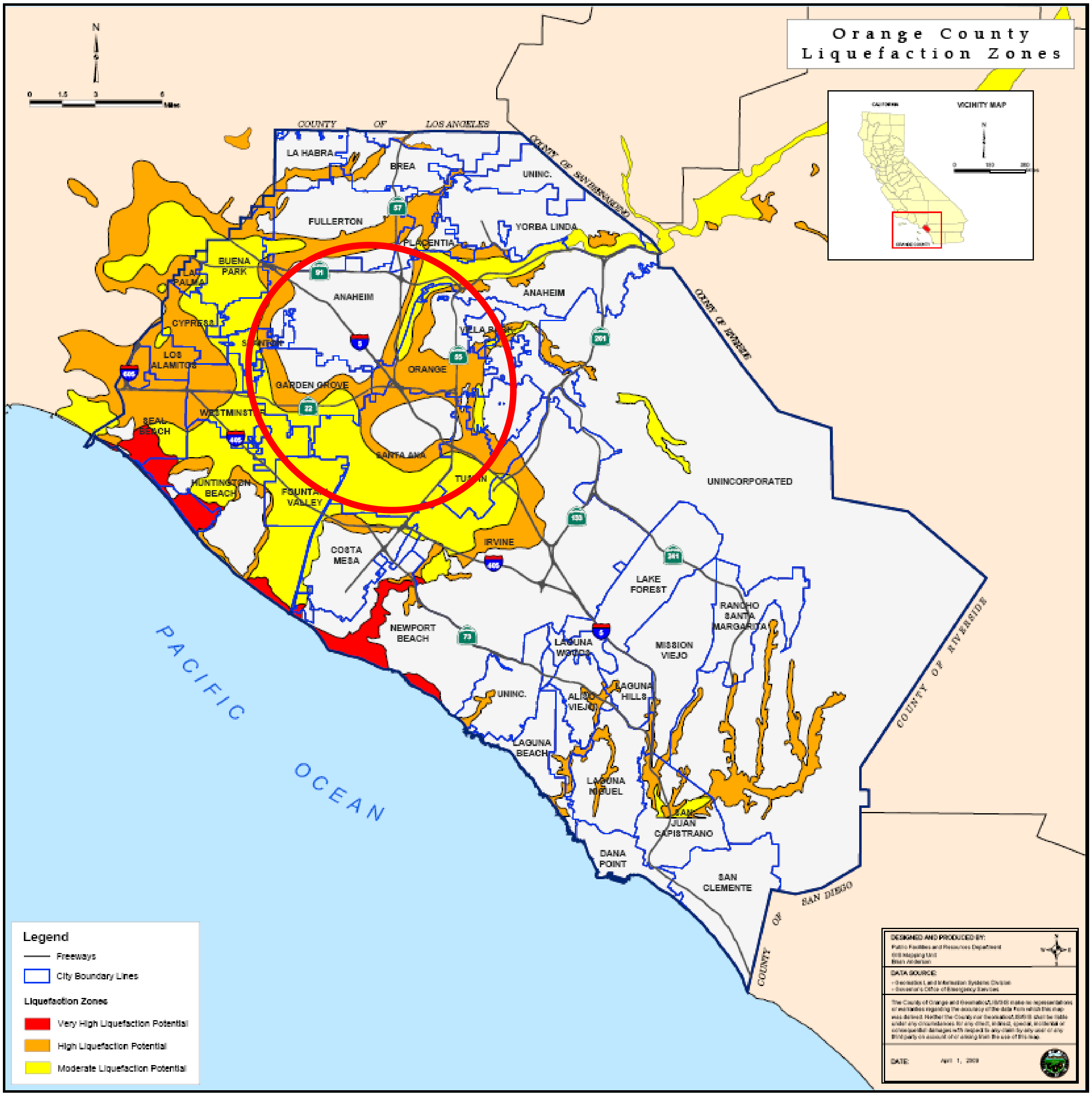
Large faults as shown below (Figure 4) could affect Orange County include the:

- San Andreas Fault
- Newport-Inglewood Fault
- Palos Verdes (off-shore)
- Whittier Fault
- Elsinore Fault
- San Jacinto Fault
- San Joaquin Hills Fault
- Puente Hills Fault

FIGURE 4: ORANGE COUNTY FAULT ZONES

ORANGE COUNTY HAZARD MITIGATION PLAN 2010

FIGURE 5: ORANGE COUNTY LIQUEFACTION ZONES



EARTHQUAKE FAULTS THAT THREATEN ORANGE COUNTY

The most recent significant earthquake event affecting Southern California was the 1994 Northridge Earthquake. At 4:31 A.M. on Monday, January 17, 1994 a moderate, but very damaging earthquake with a magnitude of 6.7 struck the San Fernando Valley. In the following days and weeks, thousands of aftershocks occurred, causing additional damage to affected structures.

Fifty-seven people were killed and more than 1,200 people seriously injured. For days afterward, thousands of homes and businesses were without electricity, tens of thousands had no natural gas, and nearly 50,000 had little or no water. Approximately 15,000 structures were moderately to severely damaged, which left thousands of people temporarily homeless. Over sixty-six thousand buildings were inspected. Nearly 4,000 were severely damaged and over 11,000 were moderately damaged. Several collapsed bridges and overpasses created commuter havoc on the freeway system. Extensive damage was caused by ground shaking, but the earthquake triggered liquefaction and dozens of fires also caused additional severe damage. This extremely strong ground motion felt in large portions of Los Angeles County resulted in record economic losses.

However, the earthquake occurred early in the morning on a holiday. This circumstance considerably reduced the potential effects. Many collapsed buildings were unoccupied, and most businesses were not yet open. The direct and indirect economic losses ran into tens of billions of dollars.

Historical and geological records show that California has a long history of seismic events. Southern California is probably best known for the San Andreas Fault, a 400 mile long fault running from the Mexican border to a point offshore, west of San Francisco. "Geologic studies show that over the past 1,400 to 1,500 years, large earthquakes have occurred at about 130 year intervals on the southern San Andreas Fault." As the last large earthquake on the southern San Andreas occurred in 1857, that section of the fault is considered a likely location for an earthquake within the next few decades according to the Southern California Earthquake Center.

But the San Andreas is only one of dozens of known earthquake faults that crisscross Southern California. Some of the better known faults include the Newport-Inglewood/Rose Canyon, Whittier, Chatsworth, Elsinore, Hollywood, Los Alamitos, Puente Hills, and Palos Verdes Faults. Beyond the known faults, there are a potentially large number of "blind" faults that underlie the surface of Southern California. One such blind fault was involved in the Whittier Narrows earthquake in October 1987.

Although the most famous of the faults, the San Andreas is capable of producing an earthquake with a magnitude of 8+ on the Richter scale, some of the "lesser" faults have the potential to inflict greater damage on the urban core of the Los Angeles Basin. Seismologists believe that a 6.0 earthquake on the Newport-Inglewood would result in far more death and destruction than a "great" quake on the San Andreas, because the San Andreas is more remote from major urban centers of Southern California.

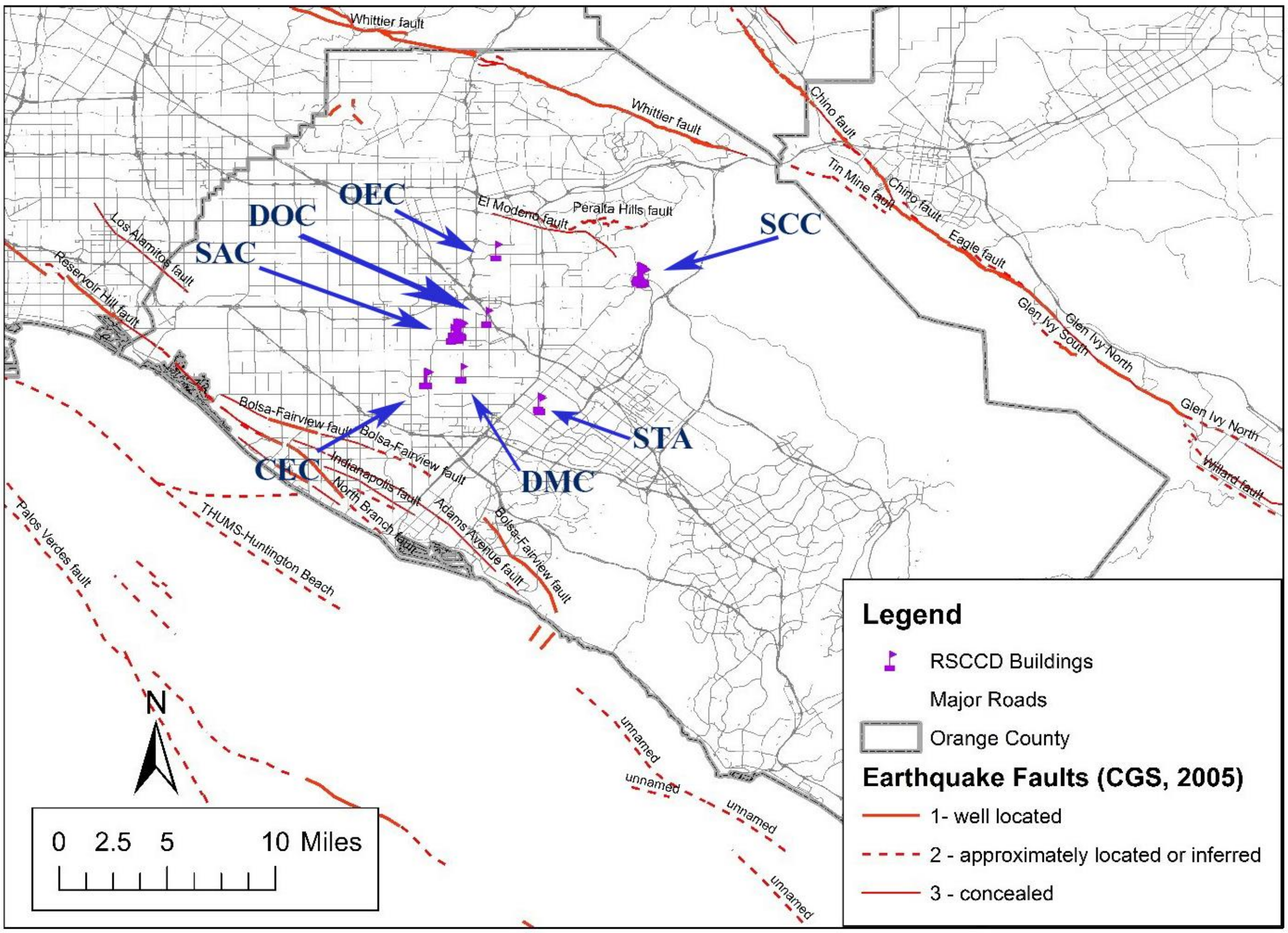
For decades, partnerships have flourished between the USGS, Caltech, the California Geological Survey and universities to share research and educational efforts with Californians. Tremendous earthquake mapping and mitigation efforts have been made in California in the past two decades, and public awareness has risen remarkably during this time. Major federal, state, and local government agencies and private organizations support earthquake risk reduction. These partners have made significant contributions in reducing the adverse impacts of earthquakes. Despite the progress, the majority of California communities remain unprepared because there is a general lack of understanding regarding earthquake hazards among Californians.

To better understand the earthquake hazard, the scientific community has looked at historical records and accelerated research on those faults that are the sources of the earthquakes occurring in the Southern California region. Historical earthquake records can generally be divided into records of the pre-instrumental period and the instrumental period. In the absence of instrumentation, the detection of earthquakes is based on observations and felt reports, and is dependent upon population density and distribution. Since California was sparsely populated in the 1800s, the detection of pre-instrumental earthquakes is relatively difficult. However, two very large earthquakes, the Fort Tejon in 1857 (7.9M) and the Owens Valley in 1872 (7.6M) are evidence of the tremendously damaging potential of earthquakes in Southern California. In more recent times two M7.3 earthquakes struck Southern California, in Kern County (1952) and Landers (1992). The damage from these four large earthquakes was limited because they occurred in areas which were sparsely populated at the time they happened. The seismic risk is much more severe today than in the past because the population at risk is in the millions, rather than a few hundred or a few thousand persons.

D. EARTHQUAKE FAULT ACTIVITY MAP - IMPACT ON RSCCD FACILITIES

MMI Engineering conducted a study of the earthquake impact on RSCCD in May 2015 for this plan. They used the Orange County HAZUS and District's facilities information and building populations. The following map of Earthquake Fault Activity Map - Impact on RSCCD shows the clusters of RSCCD buildings in purple overlaid with the Fault Activity Map of California.

FIGURE 6: RSCCD SITES AND EARTHQUAKE FAULT ACTIVITY MAP



California Geological Survey, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, Version 2.0., Reproduced with permission.

MMI ENGINEERING

E. FAULTS THAT IMPACT RSCCD

After extensive research from dozens of websites, documents, California and Orange County Hazard Mitigation Plans, and HAZUS studies, the following faults were considered the greatest threat to the RSCCD service area. The research was summarized for the RSCCD Hazard Mitigation Committee and they concurred that these five faults should be studied for this plan.

TABLE 4: LIST OF EARTHQUAKE FAULTS THAT IMPACT RSCCD

Ranking	Fault Name	Magnitude
1	San Joaquin Hills	6.6
2	Newport- Inglewood	6.9
3	Whittier	6.8
4	San Andreas	7.4
5	El Modeno	6.0
6	Puente Hills	7.1

Other faults that may impact the RSCCD service area but to a lesser extent include: Elsinore Fault and San Jacinto Fault. These faults are expected to have a lesser impact on the district.

Earthquake ShakeMap “Scenarios”

A ShakeMap is a representation of ground shaking produced by an earthquake. The information it presents is different from the earthquake magnitude and epicenter that are released after an earthquake because ShakeMap focuses on the ground shaking produced by the earthquake, rather than the parameters describing the earthquake source. So, while an earthquake has one magnitude and one epicenter, it produces a range of ground shaking levels at sites throughout the region depending on distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the Earth's crust. USGS labels ShakeMaps developed for hypothetical events with the word “Scenario” to distinguish them from ShakeMaps for actual earthquakes.

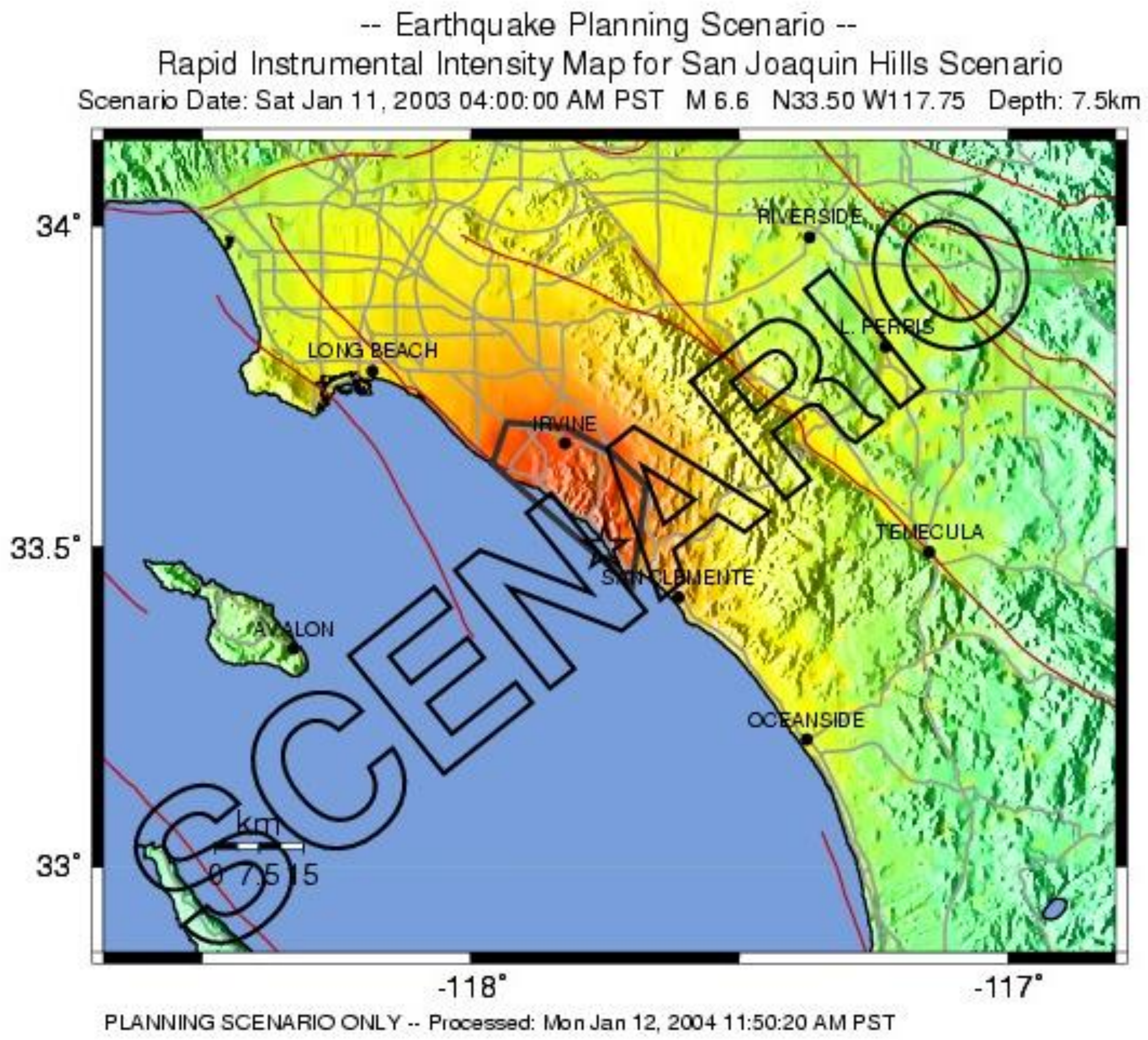
USGS researched and assumed a particular fault or fault segment will rupture over a certain length relying on consensus-based information about the potential behavior of the fault. For historic events, the actual rupture dimensions may be constrained based on existing observations or models. Second, they estimates the ground motions at all locations in a chosen region surrounding the causative fault.

<u>These earthquake scenarios are not earthquake predictions.</u> That is, no one knows in advance when or how large a future earthquake will be. However, if we make assumptions about the size and location of a hypothetical future earthquake, we can make a reasonable prediction of the effects of the assumed earthquake, particularly the way in which the ground will shake. This knowledge of the potential shaking effects is the main benefit of the earthquake scenario for planning and preparedness purposes

SAN JOAQUIN HILLS FAULT

The San Joaquin Hills fault was only discovered in the 1990's by Lisa Grant of UCI. It is a southwest-dipping blind thrust fault originating near the southern end of the Newport-Inglewood Fault close to south Huntington Beach and runs south to Dana Point. Rupture of the entire area of this blind thrust fault could generate an earthquake as large as M7.3. In addition, a minimum average recurrence interval of between about 1650 and 3100 years has been estimated for moderate-sized earthquakes on this fault (Lisa Grant, 1999).

FIGURE 7: M6.6 SAN JOAQUIN HILLS SCENARIO



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

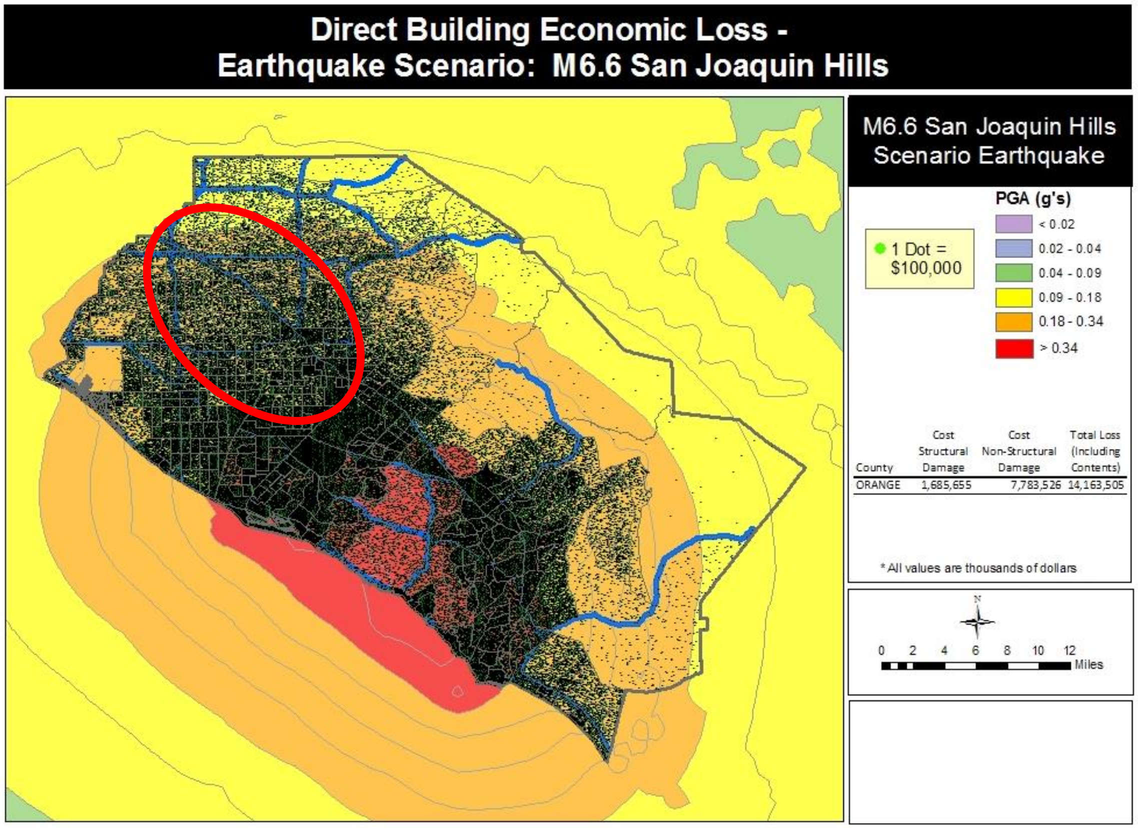
TABLE 5: SUMMARY OF HAZUS M6.6 SAN JOAQUIN HILLS FOR ORANGE COUNTY

Impact Category	HAZUS-Estimated Impact
Economic Loss due to Building Damage Total Building-related Direct Economic Loss	$9.5 B $14.2 B
# Buildings in Complete Damage State	663
Debris Generated (million tons)	3.33
Displaced Households People Needing Short-term Shelter	4,800 Households 3,200 People
Fatalities (2 am, 2 pm, 5 pm) Total Injuries (2 am, 2 pm, 5 pm)	17, 87, 95 2238, 4006, 3491
% of Households without Water	35%
# Highway Bridges w/ at least Moderate Damage (potentially closed)	8
Fire Following Earthquake* Ignitions, area burned, $ loss	78,056 square miles, $240M

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

In a M6.6 earthquake on the San Joaquin Hills Fault, Orange County dollar losses related to shaking-induced building damage are estimated to reach $9.5 billion, while total direct economic losses are expected to exceed $14 billion. The geographic distribution of total direct economic loss is mapped below.

FIGURE 8: DIRECT ECONOMIC LOSS IN OC M6.6 SAN JOAQUIN HILLS



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

Of the approximately 738,000 buildings modeled within the general building stock for Orange County, less than 1% (663) would be expected to suffer “Complete” damage in the San Joaquin Hills 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). More than 10,000 buildings (1.4%) 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 13% (94,926) would be expected to suffer “Moderate” damage, and an additional 43% (318,293) would suffer “Slight” damage. More than 3.3 million tons of debris may result from these damaged buildings – 63% is expected to be heavy debris (concrete and steel), requiring heavy equipment to break down and remove, while 37% is expected to be light debris (wood, brick and other debris).

Damage to single family and multi-family dwellings is expected to result in the displacement of approximately 4,800 households. As much as 35% of the County’s households may also be without water. While many of the displaced may find shelter with friends and family, or in available hotels, more than 3,200 people are expected to seek public shelter. Depending on the time of day when the earthquake occurs, the number of people killed as a result of shaking-induced building and transportation system damage may range from 17 (at 2 am, when most of the population are located in relatively safe residential structures) to as many as 95 (at 5 pm, when many people are either in commercial or industrial buildings, or commuting). Total injuries, including the range of injuries from minor injuries treated with basic medical care to mortal injuries (deaths), ranges from approximately 2200 at 2 am to 4000 at 2 pm. Transportation of the injured for treatment could be impacted by transportation system damage, with as many as 8 bridges in the western part of the County suffering at least "Moderate" damage.

Additional economic damage may result from post-earthquake fire. The current HAZUS study model estimates as many as 78 fire ignitions, most of which will be contained. However, a total of approximately ½ square mile is expected to burn, resulting in losses of approximately $240 million. It should be noted that the HAZUS model is currently undergoing significant improvements; future analyses will likely yield different FFE results, so these results should be used with caution.

ESSENTIAL FACILITY IMPACTS

The table below provides an overview of essential facility performance in the San Joaquin Hills 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 6% damage or less for EOCs, fire stations, police stations, and schools, but as much as 19% damage for large hospitals. Total economic loss for essential facilities has been estimated to exceed $426 million, with 74% of the total loss occurring in schools. It should be noted that although cost data is only available for 19 hospital buildings (out of 157), these 19 buildings suffer more than $112 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 6: OC ESSENTIAL FACILITY LOSS ESTIMATES M6.6 SAN JOAQUIN HILLS

Essential Facility	Category	No. of Facilities/ Sites	No. of Buildings	No. of Beds	Replace-ment Cost ($1,000)	# Buildings w/ replace-ment cost data	Function-ality Day 1 (%)	Mean Damage	Economic Loss ($1,000)
Hospital	Small	2	3	78	$0	0	60	13%	$0
	Medium	10	33	1,018	$50,000	7	42	9%	$5,845
	Large	20	121	5,221	$677,998	12	25	19%	$106,291
Schools	K-12 (default data)	560	569		$335,710	569	47	4%	$12,470
	K-12 (providing data)	346	4,952		$2,983,628	4,840	40	6%	$281,544
	Comm College Districts (providing data)	22	212		$461,676	207	55	5%	$20,228
EOCs		38	38		$368,079	38	57	6%	$18
Police Stations		67	67		$770,105	67	48	6%	$49
Fire Stations		139	139		$316,580	135	55	5%	$14
TOTALS		**1,204**	**6,134**	**6,317**	**$5,963,776**	**5,875**			**$426,459**

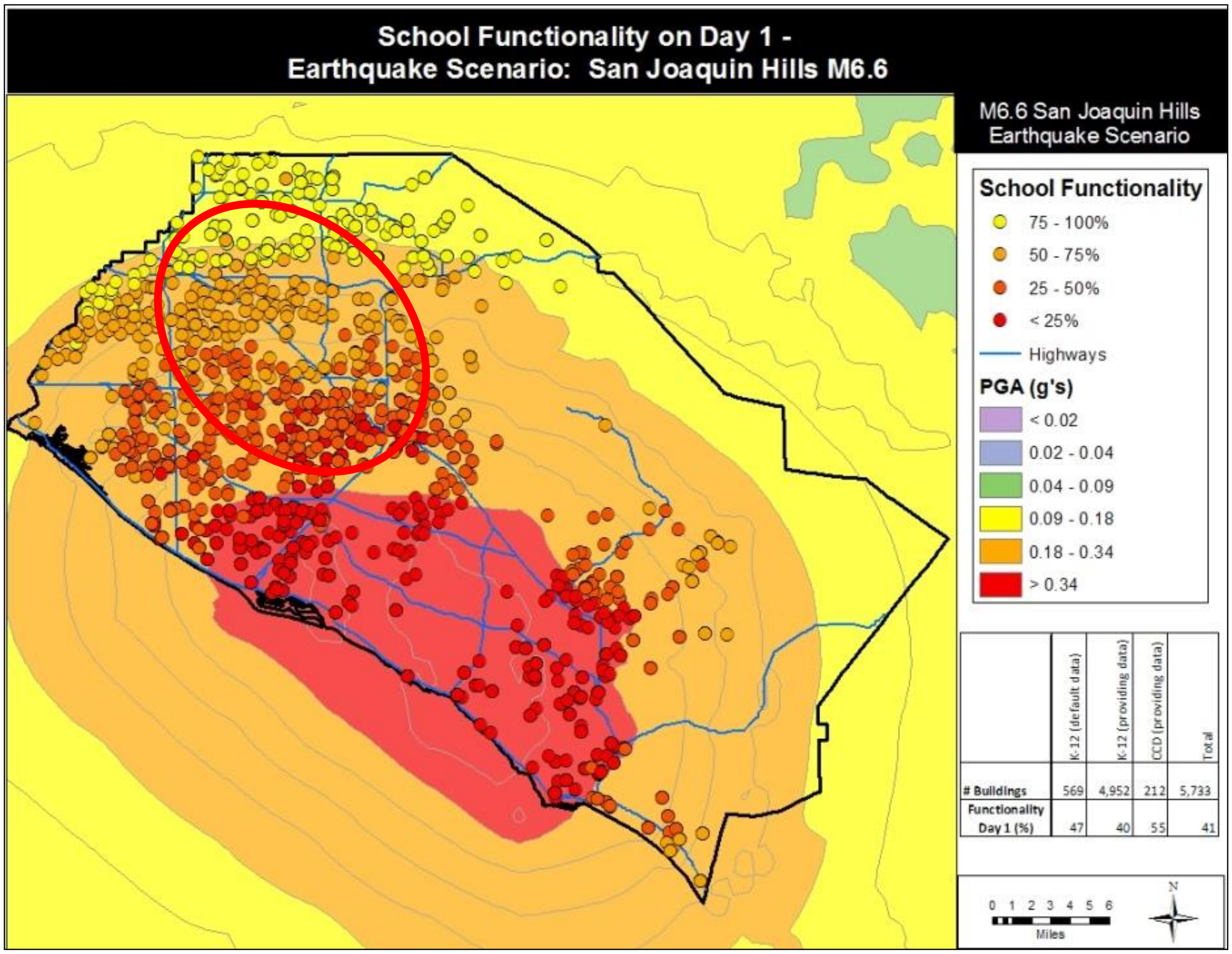
ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

Table 7: Estimated Impacts OC School Districts M6.6 San Joaquin Hills

Category	District Name	Number of Facilities/ Sites*	No. of Buildings	Replacement Cost ($1,000)	# Buildings w/ replacement cost data	Functionality Day 1 (%)	Mean Damage	Economic Loss ($1,000)
K-12 (default data)		560	569	$335,710	569	47	3.7%	$12,470
K-12 (providing data)	Brea Olinda USD	11	118	$83,802	117	86	0.9%	$1,194
	Capistrano USD	60	1,035	$387,399	1,029	26	6.8%	$26,236
	Fullerton Joint UHSD	12	156	$219,752	156	74	2.6%	$4,869
	Fullerton SD	22	267	$121,646	267	79	1.2%	$1,368
	Huntington Bch City SD	15	176	$115,876	176	24	9.6%	$22,345
	Huntington Bch Union High School District	9	163	$237,697	163	37	5.9%	$17,716
	Laguna Beach USD	7	54	$60,212	54	10	17.1%	$15,604
	Newport-Mesa USD	36	518	$402,503	518	13	12.8%	$88,316
	Ocean View SD	24	238	$149,274	238	43	5.4%	$12,479
	Orange Co DOE	33	180	$54,255	75	45	4.6%	$6,323
	Placentia-Yorba Linda USD	30	641	$292,554	641	80	1.1%	$2,708
	Santa Ana USD	57	1,046	$623,817	1,046	28	6.5%	$66,990
	Tustin USD	30	360	$234,841	360	33	6.0%	$15,397
Comm. CD (providing data)	North Orange Co CCD	7	90	$304,134	90	78	1.3%	$4,564
	Rancho Santiago CCD	15	122	$157,542	117	38	7.0%	$15,664
TOTALS		**928**	**5,733**	**$3,781,014**	**5,616**	**41**	**6%**	**$314,242**

* includes District offices and other facilities (e.g., maintenance, transportation, etc.)
Orange County Essential Facilities Risk Assessment Report prepared for FEMA
RSCCD estimate was based on an older version of insurance data

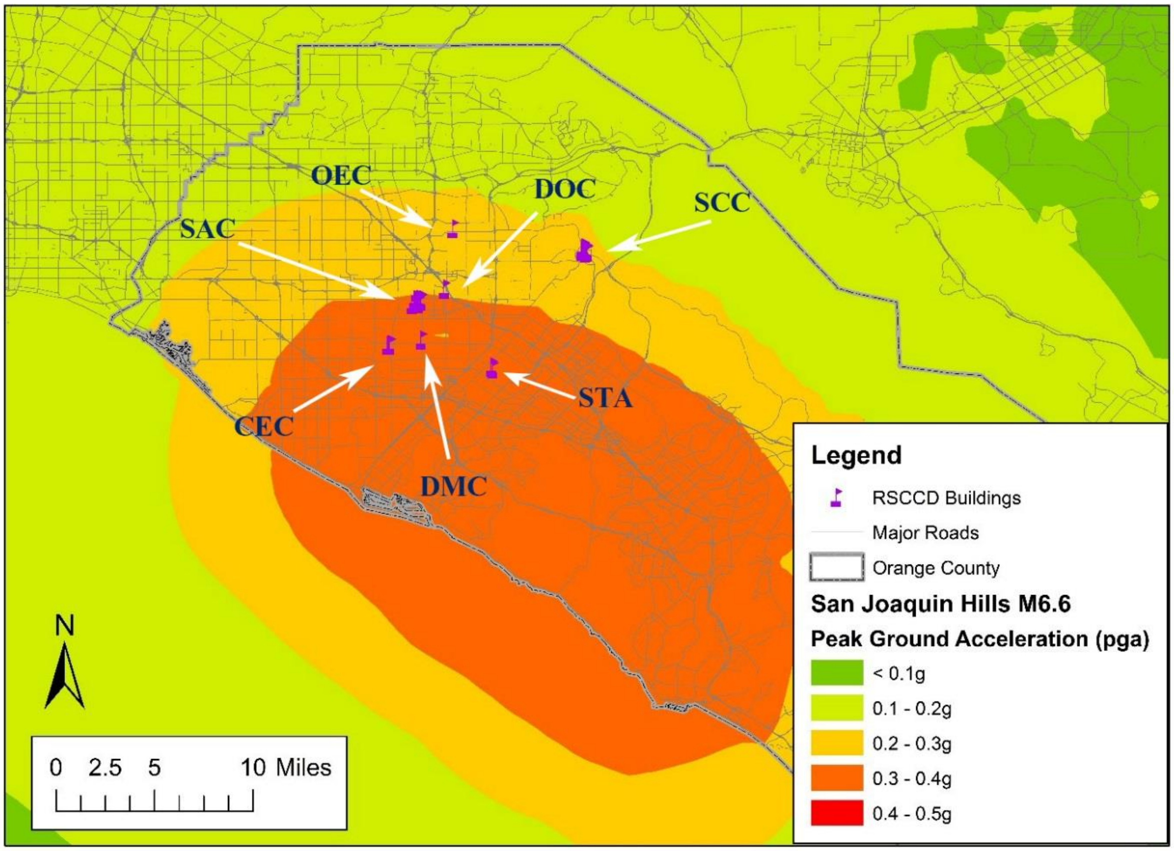
FIGURE 9: OC SCHOOL FUNCTIONALITY M6.6 SAN JOAQUIN HILLS



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

The San Joaquin Hills Fault, a large blind thrust fault, could generate an earthquake as large as M7.1 in the vicinity of Newport Beach. This large earthquake would create strong ground motion and damage across a significant portion of the County, but is a rare event with a recurrence interval on the order of 2,500 years (UCI, 1999).

FIGURE 10: RSCCD IMPACT FROM A M6.6 EARTHQUAKE ON THE SAN JOAQUIN HILLS



USGS ShakeMap for the M6.6 Scenario Earthquake on the San Joaquin Hills Fault: Peak Ground Acceleration
MMI ENGINEERING

TABLE 8: RSCCD SITE IMPACT FROM A M6.6 SAN JOAQUIN HILLS FAULT

Site		District Location	Peak Ground Acceleration	Modified Mercalli Intensity	Perceived Shaking	Potential Damage
1	DOC	District Operations Center	0.2 – 0.3 g	VII	Very Strong	Moderate
2	**SAC**	**Santa Ana College**	**0.3 – 0.4 g**	**VIII**	**Severe**	**Moderate/Heavy**
3	SCC	Santiago Canyon College	0.2 – 0.3 g	VII	Very Strong	Moderate
4	**CED**	**Centennial Education Center**	**0.3 – 0.4 g**	**VIII**	**Severe**	**Moderate/Heavy**
5	PEC	Orange Education Center	0.2 - 0.3 g	VII	Very Strong	Moderate
7	**SRTA**	**Orange County Sheriff's Regional Training Academy**	**0.3 – 0.4 g**	**VIII**	**Severe**	**Moderate/Heavy**
8	**DMC**	**Digital Media Center**	**0.3 – 0.4 g**	**VIII**	**Severe**	**Moderate/Heavy**

NEWPORT-INGLEWOOD FAULT ZONE

This fault extends from the Santa Monica Mountains southeastward through the western part of Orange County, through Huntington Beach and to the offshore area near Newport Beach. It was the source of the destructive 1933 Long Beach earthquake (magnitude 6.4), which caused 120 deaths and considerable property damage. During the past 60 years, numerous other shocks ranging from magnitude 3.0 to 5+ have been recorded. Southern California Earthquake Center reports probable earthquake Magnitudes for the Newport-Inglewood fault to be in the range of 6.0 to 7.4.

The epicenter of the 1933 Long Beach earthquake was in Huntington Beach. Orange County had minimal population and few structures in 1933. Because of this, most of the deaths, injuries and damage was in the more built environment, the Long Beach area. There were 4 deaths in Orange County and several schools were seriously damaged in Santa Ana, Garden Grove and Huntington Beach.

Newport-Inglewood Fault Facts
Nearest Communities: Orange County cities potentially affected by the fault are Seal Beach, Huntington Beach, Newport Beach, and Costa Mesa and surrounding areas
Most Recent Major Rupture: March 10, 1933, M6.4 (but no surface rupture)
Interval Between Major Ruptures: unknown
Probable Magnitudes: M6.0 - 7.4

This represents a worst-case earthquake that could affect the urban areas of the Orange County coast. In California, each earthquake is followed by revisions and improvements in the Building Codes.

Due to the number of schools that were damaged in the 1933 Long Beach earthquake, it resulted in the Field Act being passed by the California legislature, mandating improved building codes for school construction. These code changes have resulted in stronger and more earthquake resistant public school structures.

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. This state law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. Surface rupture is the most easily avoided seismic hazard.

The Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides. The State Department of Conservation operates the Seismic Mapping Program for California. Extensive information is available at their website: http://gmw.consrv.ca.gov/shmp/index.htm.

The Newport-Inglewood Fault Zone is a right-lateral fault, running from Newport Beach and Costa Mesa at its southern end, to Culver City and Inglewood at its northern end. The most recent significant earthquake on the Newport-Inglewood Fault was the 1933 M6.4 Long Beach earthquake, in which 120 people were killed, and causing $50 million in damage (SCEC). An event of this size has a recurrence interval on the order of 1000 years. Many schools were destroyed (top right photo is Compton Middle School). Because of this, parents lobbied legislators to enact the world's first building codes. Had this earthquake occurred during school hours, we could have lost an entire generation of school children. It struck at 5:54 PM.

FIGURE 11: 1933 LONG BEACH EARTHQUAKE PHOTOS

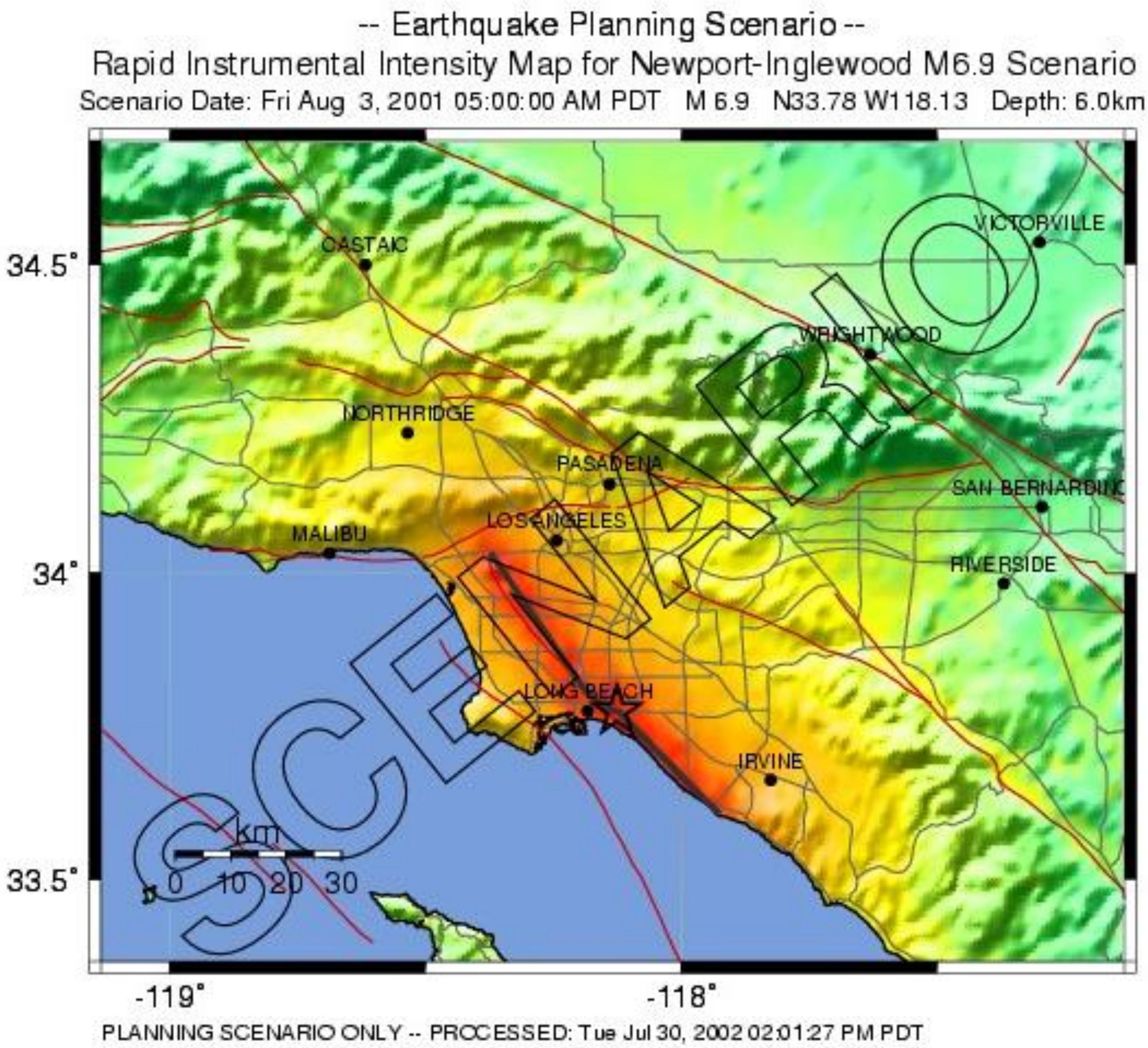
Excerpt from www.anaheimcolony.com/ -

> *On March 10, 1933 at 5:54 in the evening, a severe earthquake shook Southern California. Four deaths occurred in Orange County. In Santa Ana, a man and his wife raced out of the Rossmore Hotel and were crushed under an avalanche of bricks and mortar. Another man, while walking in front of the Richelieu Hotel, was struck by a piece of falling cornice and instantly killed. In Garden Grove, a 13-year old girl was planning a freshman party with her friends when the earthquake hit. She was sitting on the steps of a local high school and was crushed by a falling wall. Two of her friends were injured.*
>
> *In Newport Beach, 800 chimneys were broken off at the roofline and several hundred buildings were destroyed. In Huntington Beach, steel oil derricks were "squashed" several inches out of the ground. In Santa Ana, Anaheim and Garden Grove, business centers were badly damaged and debris covered downtown streets. A heavy fog enveloped the Southland, making rescue work difficult. The 1933 Long Beach earthquake affected 75,000 square miles, and resulted in the formation of more stringent building codes for California structures.*

As reported in the RSCCD Century of Excellence, the 100th anniversary newspaper: The Santa Ana Community College once occupied a tiny building within Santa Ana High School and has evolved from its modest 25-strong student body to educate at least 30,000 students a semester.

"In 1933, an incident out of anyone's control would force Santa Ana College to move out from under the auspices of the high school when the magnitude 6.3 Long Beach earthquake and a series of aftershocks rumbled through the southland. Santa Ana College's building was amongst the worst hit. Classes were suspended for two weeks. Eventually, the east building was condemned and then demolished."

FIGURE 12: SHAKEMAP M6.9 NEWPORT-INGLEWOOD SCENARIO (USGS, 2001)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

NEWPORT-INGLEWOOD EARTHQUAKE SCENARIO – REGIONAL IMPACTS

The M6.9 Newport-Inglewood scenario earthquake will impact the western and northwestern communities and infrastructure of Orange County. A summary of regional impacts is provided in the table below. These impacts described below are tabulated in more detail in the HAZUS "Global Summary Report" for this scenario earthquake. This report can be found in the Appendices of the Orange County Hazard Mitigation Plan.

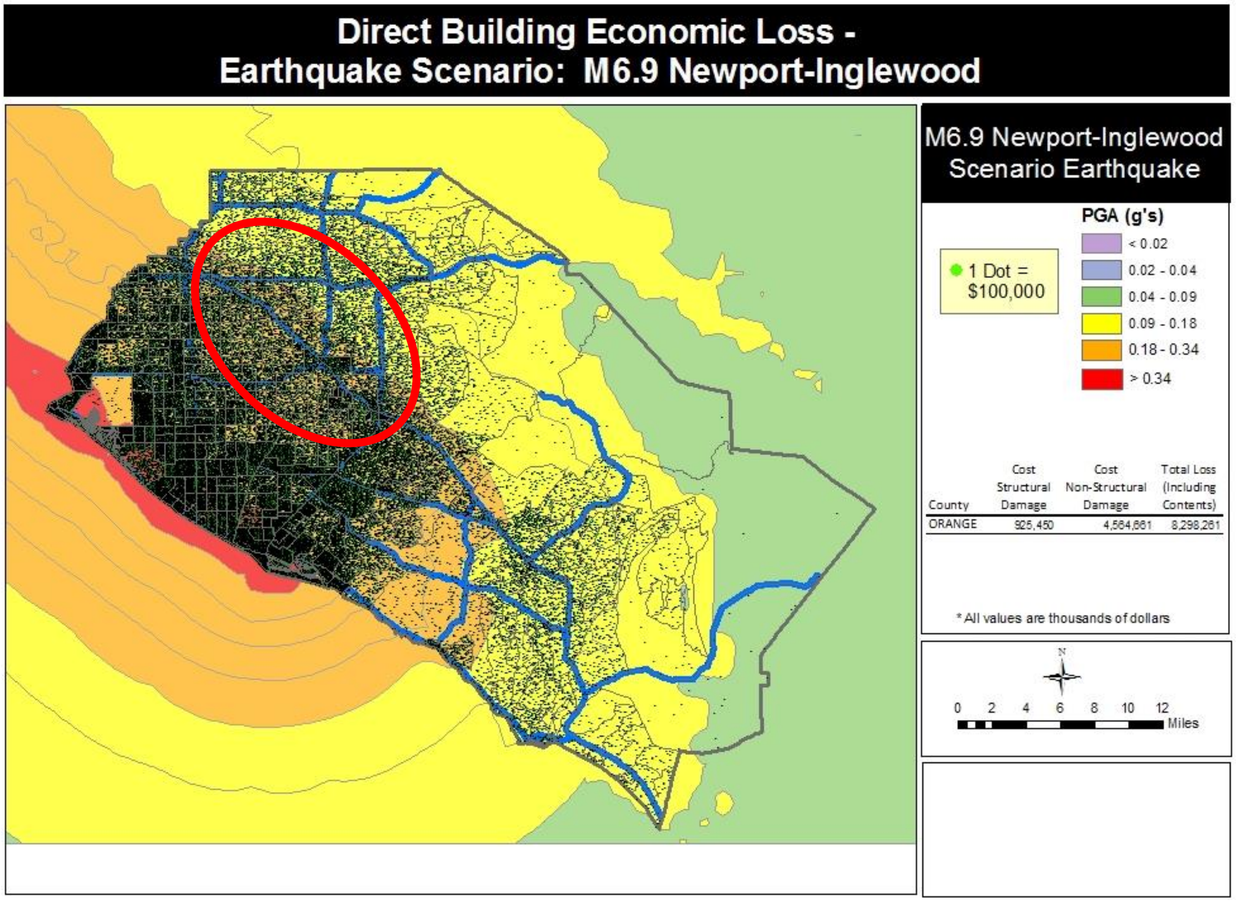
TABLE 9: HAZUS REGIONAL IMPACTS M6.9 NEWPORT-INGLEWOOD

Impact Category	HAZUS-Estimated Impact
Economic Loss due to Building Damage Total Building-related Direct Economic Loss	\$5.5 B \$8.3 B
# Buildings in Complete Damage State	655
Debris Generated (million tons)	1.94
Displaced Households People Needing Short-term Shelter	3,300 Households 2,050 People
Fatalities (2 am, 2 pm, 5 pm) Total Injuries (2 am, 2 pm, 5 pm)	13, 44, 49 1408, 2209, 1950
% of Households without Water	20%
# Highway Bridges w/ at least Moderate Damage (potentially closed)	18
Fire Following Earthquake* Ignitions, area burned, \$ loss	128,054 square miles, \$311M

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

In a M6.9 earthquake on the Newport-Inglewood Fault, dollar losses related to shaking-induced building damage are estimated to reach \$5.5 billion, while total direct economic losses are expected to reach \$8.3 billion. Within HAZUS, total direct economic losses include building and content losses, as well as inventory loss and income losses (which includes relocation costs, income losses, wage losses and rental income losses). The geographic distribution of total direct economic loss is mapped below.

FIGURE 13: TOTAL DIRECT ECONOMIC LOSS OC M6.9 NEWPORT-INGLEWOOD



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

Of the approximately 738,000 buildings modeled within the general building stock for Orange County, less than 1% (655) are expected to suffer "Complete" damage in the Newport-Inglewood scenario earthquake. These building 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 7,500 buildings (1%) 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 7% (53,320) would be expected to suffer "Moderate" damage, and an additional 29% (215,733) would suffer "Slight" damage. As much as 1.94 million tons of debris may result from these damaged buildings – 62% is expected to be heavy debris (concrete and steel), requiring heavy equipment to break down and remove, while 38% is expected to be light debris (wood, brick and other debris).

Damage to single family and multi-family dwellings is expected to result in the displacement of more than 3,300 households. As much as 20% of the County's households may also be without water. While many of the displaced may find shelter with friends and family, or in available hotels, as many as 2,000 people are expected to seek public shelter. Depending on the time of day when the earthquake occurs, the number of people killed as a result of shaking-induced building and transportation system damage may range from 13 (at 2 am, when most of the population are located in relatively safe residential structures) to as many as 49 (at 5 pm, when many people are either in commercial or industrial buildings, or commuting). Total injuries, including the range of injuries from minor injuries treated with basic medical care to mortal injuries (deaths), ranges from approximately 1,400 at 2 am to 2,200 at 2 pm. Transportation of the injured for treatment could be impacted by transportation system damage, with as many as 18 bridges in the northwest part of the County suffering at least “Moderate” damage.

Additional economic damage may result from post-earthquake fire. The current HAZUS FFE model estimates as many as 128 fire ignitions, most of which will be contained. However, a total of approximately ½ square mile is expected to burn, resulting in losses of approximately $311 million.

NEWPORT-INGLEWOOD – ESSENTIAL FACILITY IMPACTS

The table below provides an overview of essential facility performance in the Newport-Inglewood 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 provided 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 ranges from as little as 2 - 3% damage overall for schools, to as much as 15% for large hospitals. Total economic loss for essential facilities has been estimated to exceed $280 million, the bulk of which ($218 million) will occur in schools. It should be noted that although cost data is only available for 19 hospital buildings (out of 157), these 19 buildings suffer more than $45 million in loss. (The full economic impact on hospitals can't be estimated at this time because of the lack of comprehensive replacement value data.)

TABLE 10: ESSENTIAL OC FACILITY LOSSES M6.9 NEWPORT-INGLEWOOD

Essential Facility	Category	No. of Facilities / Sites	No. of Buildings	No. of Beds	Replacement Cost ($1,000)	# Buildings w/ replace-ment cost data	Function -ality Day 1 (%)	Mean Damage	Economic Loss ($1,000)
Hospital	Small	2	3	78	$0	0	60	10%	$0
	Medium	10	33	1,018	$50,000	7	47	9%	$2,462
	Large	20	121	5,221	$677,998	12	43	15%	$43,229
Schools	K-12 (default data)	560	569		$335,710	569	64	2%	$7,553
	K-12 (providing data)	346	4,952		$2,983,628	4,840	65	3%	$218,017
	Com Col Districts (providing data)	22	212		$461,676	207	71	2%	$15,742
EOCs		38	38		$368,079	38	69	4%	$12
Police Stations		67	67		$770,105	67	59	5%	$39
Fire Stations		139	139		$316,580	135	69	4%	$11
TOTALS		**1,204**	**6,134**	**6,317**	**$5,963,776**	**5,875**			**$287,065**

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

SCHOOLS

The default schools database in HAZUS MR3 for Orange County includes 809 school sites, including both public schools and some private schools and pre-schools. Community colleges and Universities are not included in the default school database. It should be noted that HAZUS represents each school campus as a single record in the default database, regardless of the number of buildings on site. (This essentially assumes uniform performance of all structures at a given school site, when in reality, buildings of different construction types are expected to perform differently.) RSCCD participated in the study.

Detailed school building insurance appraisal data was received from the Alliance of Schools for Cooperative Insurance Programs (ASCIP) for fifteen (15) member districts in Orange County, including two community college districts. These school districts include 50% of the public grade schools in Orange County and 51% of the County's public school enrollment. Data includes site-specific information on 6,371 insured structures (including a number of non-building structures that were omitted from the final database), accounting for almost 25 million square feet, and a replacement value of over $3.6 billion dollars.

Detailed construction data was provided for 5,164 individual school buildings, allowing a more detailed HAZUS risk assessment (e.g., building level rather than site level) for these facilities. The data received is sufficiently detailed to allow the Project Team to categorize each school building for which data was received according to the required HAZUS parameters (e.g., structure type, design level, configuration, etc.) and develop an enhanced (Level 2+) input database for HAZUS. The 569 schools in the remaining K-12 school districts have been analyzed using default HAZUS data.

TABLE 11: SCHOOL DISTRICTS FOR WHICH ASCIP PROVIDED SITE-SPECIFIC DATA

District Type	District Name
K-12 School Districts	Brea Olinda Unified School District
	Capistrano Unified School District
	Fullerton Joint Union High School District
	Fullerton School District
	Huntington Beach City School District
	Huntington Beach Union High School District
	Laguna Beach Unified School District
	Newport-Mesa Unified School District
	Ocean View School District
	Orange County Dept. Of Education
	Placentia-Yorba Linda Unified School District
	Santa Ana Unified School District
	Tustin Unified School District
Community College Districts	North Orange County Community College District
	Rancho Santiago Community College District

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

TABLE 12: ESTIMATED IMPACTS OC SCHOOL DISTRICTS M6.9 NEWPORT-INGLEWOOD

Category	District Name	Number of Facilities/ Sites*	No. of Buildings	Replacement Cost ($1,000)	# Buildings w/ replacement cost data	Functionality Day 1 (%)	Mean Damage	Economic Loss ($1,000)
K-12 (default data)		560	569	$335,710	569	64	2.2%	$7,553
K-12 (providing data)	Brea Olinda USD	11	118	$83,802	117	90	0.7%	$933
	Capistrano USD	60	1,035	$387,399	1,029	90	0.5%	$1,598
	Fullerton Joint UHSD	12	156	$219,752	156	73	2.9%	$5,180
	Fullerton SD	22	267	$121,646	267	79	1.2%	$1,534
	Huntington Bch SD	15	176	$115,876	176	15	12.6%	$32,573
	Huntington Bch UHSD	9	163	$237,697	163	19	10.6%	$36,350
	Laguna Beach USD	7	54	$60,212	54	67	2.9%	$2,908
	Newport-Mesa USD	36	518	$402,503	518	23	9.9%	$75,649
	Ocean View SD	24	238	$149,274	238	20	10.6%	$26,499
	Orange Co Dept. of Ed	33	180	$54,255	75	69	2.1%	$2,479
	Placentia-Yorba Linda USD	30	641	$292,554	641	89	0.6%	$1,676
	Santa Ana USD	57	1,046	$623,817	1,046	60	2.7%	$27,540
	Tustin USD	30	360	$234,841	360	76	1.4%	$3,096
Com College Districts (providing data)	North Orange Co CCD	7	90	$304,134	90	72	2.0%	$10,405
	Rancho Santiago CCD	15	122	$157,542	117	70	2.6%	$5,336
TOTALS		**928**	**5,733**	**$3,781,014**	**5,616**	**65**	**3.3%**	**$241,311**

* includes District offices and other facilities (e.g., maintenance, transportation, etc.)

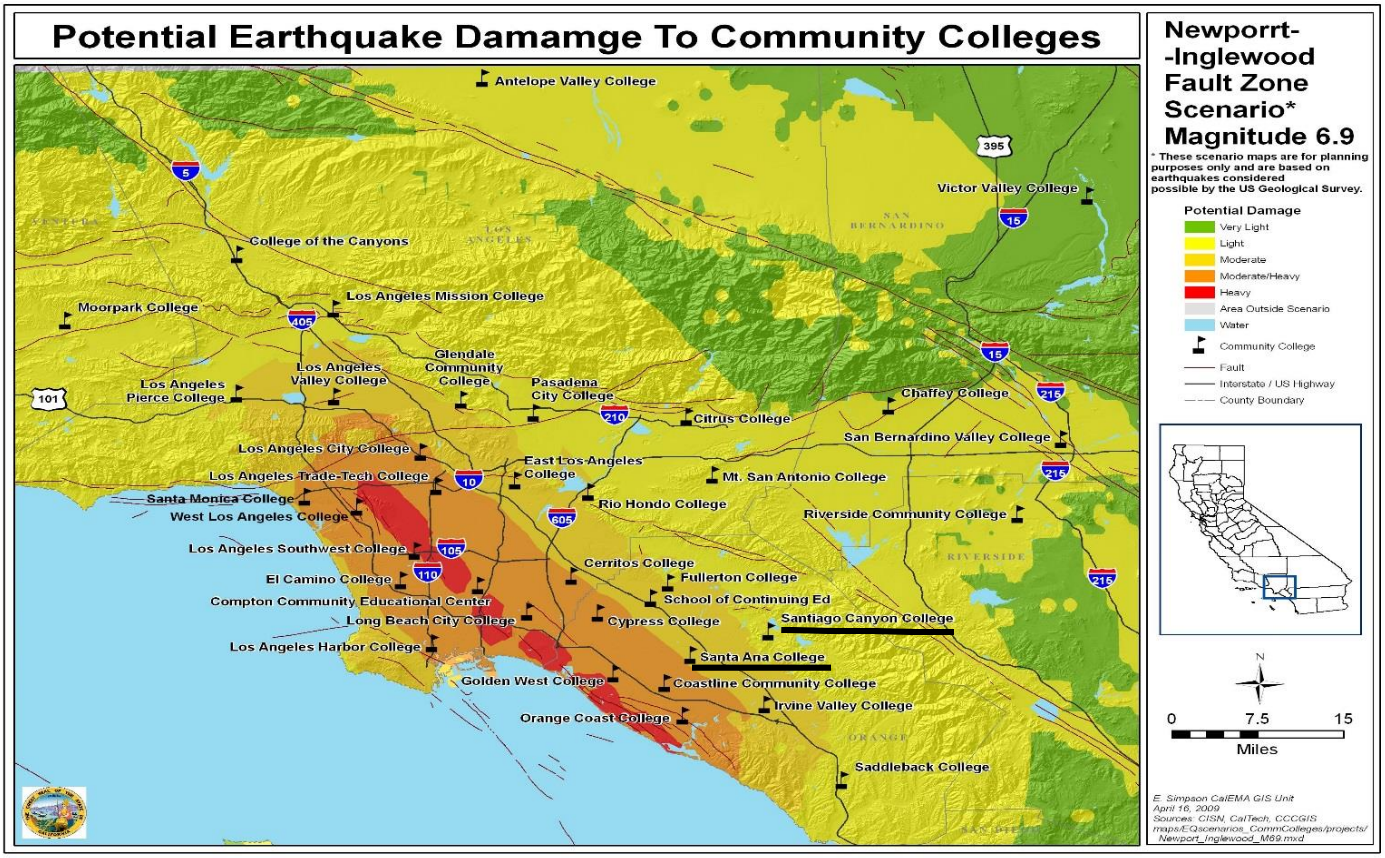
RSCCD estimate was based on an older version of insurance data

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

The following map shows the general impact of the Newport-Inglewood Fault Zone on the southern California community colleges.

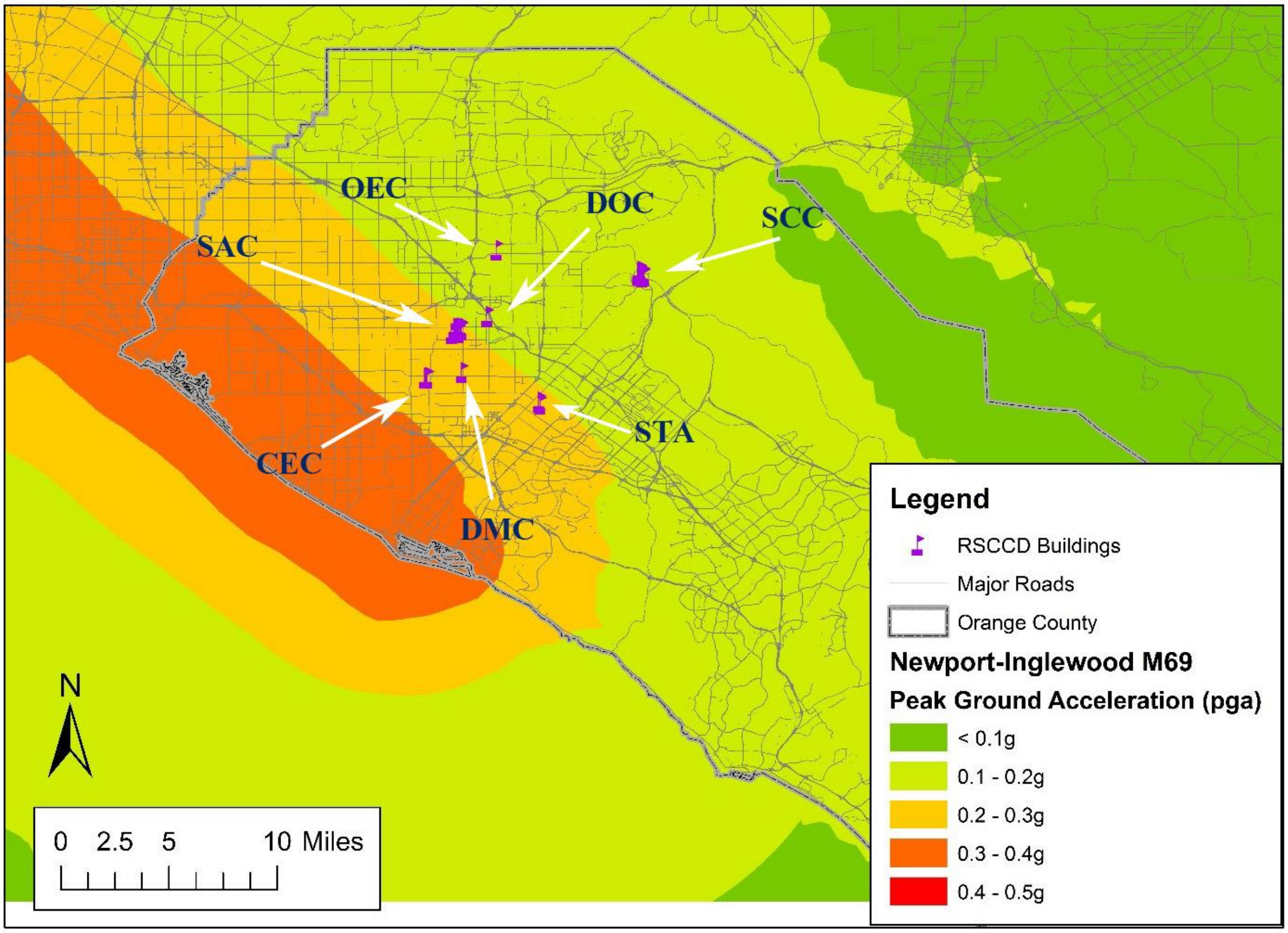
Santa Ana Community borders the “Moderate/Heavy and the Moderate” potential damage while the Santiago Canyon College is located in the “Light” potential damage.

FIGURE 14: POTENTIAL DAMAGE-OC COLLEGES M6.9 NEWPORT-INGLEWOOD



STATE OF CALIFORNIA OES

FIGURE 15: RSCCD IMPACT FROM THE M6.9 NEWPORT-INGLEWOOD



USGS ShakeMap for the M6.9 Scenario Earthquake on the Newport-Inglewood Fault: Peak Ground Acceleration
MMI ENGINEERING

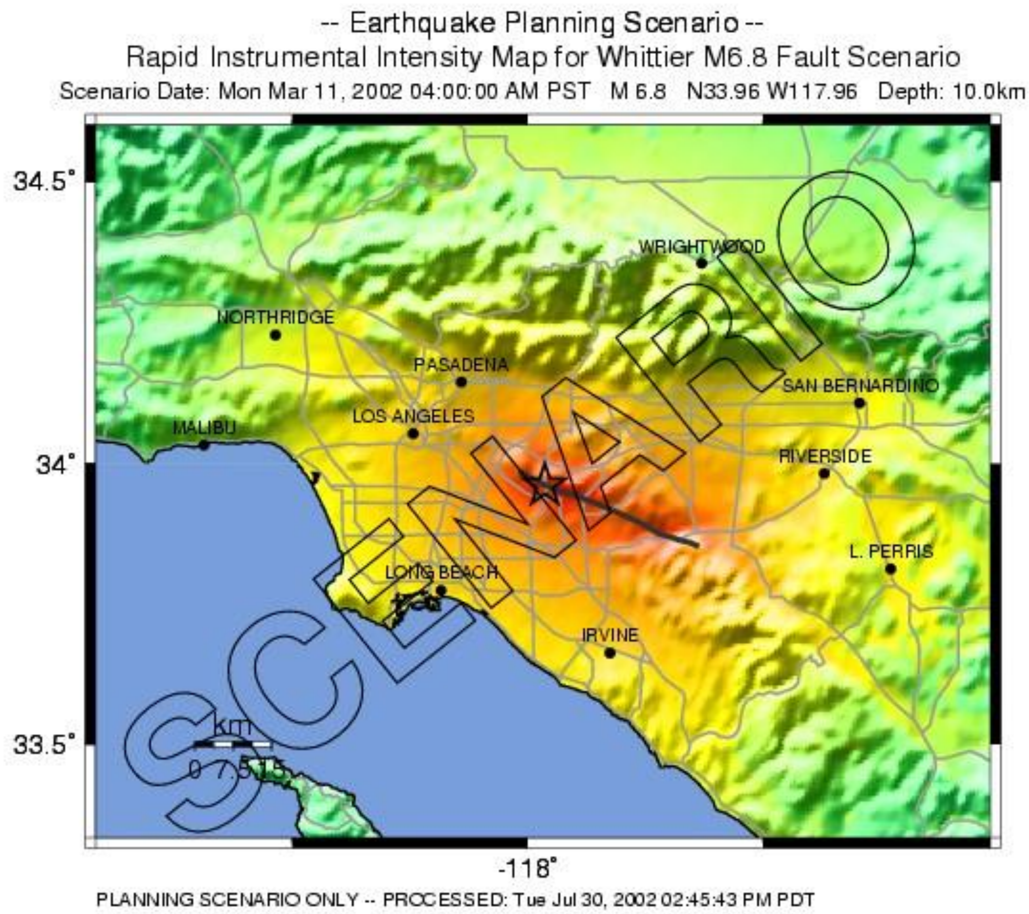
TABLE 13: RSCCD SITE IMPACT FROM A M6.9 NEWPORT-INGLEWOOD FAULT

Site	Abbr	District Location	Peak Ground Acceleration	Modified Mercalli Intensity	Perceived Shaking	Potential Damage
1	DOC	District Operations Center	0.1 – 0.2g	VI	Strong	Light
2	SAC	Santa Ana College	0.2 – 0.3 g	VII	Very Strong	Moderate
3	SCC	Santiago Canyon College	0.1 – 0.2g	VI	Strong	Light
4	CEC	Centennial Education Center	0.2 – 0.3 g	VII	Very Strong	Moderate
5	OEC	Orange Education Center	0.1 – 0.2g	VI	Strong	Light
7	STA	Sheriff's Training Academy	0.2 – 0.3 g	VII	Very Strong	Moderate
8	DMC	Digital Media Center	0.2 – 0.3 g	VII	Very Strong	Moderate

WHITTIER FAULT

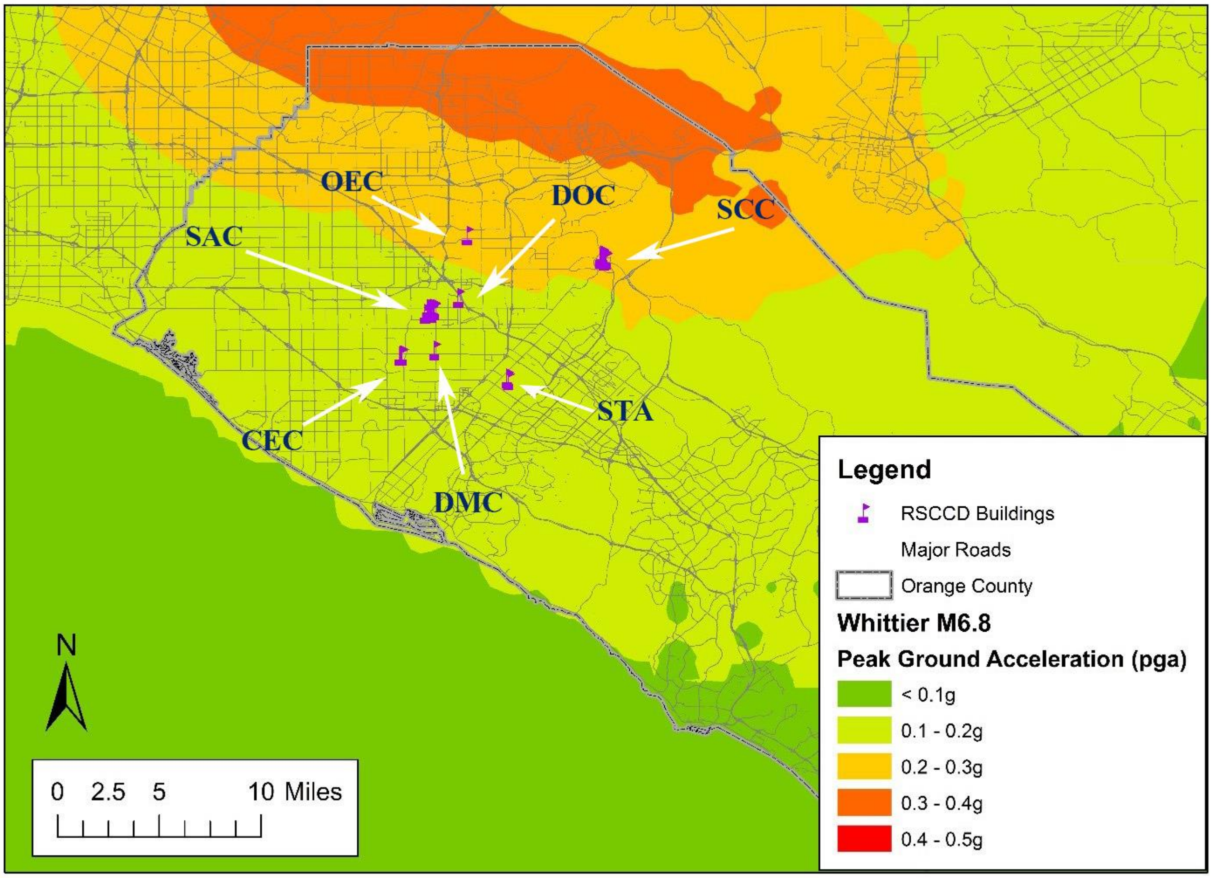
Type of Fault: Right-lateral strike-slip with some reverse slip
Length of Fault: About 40 km
Nearest Community: Yorba Linda, Hacienda Heights, Whittier
Most Recent Surface: Rupture: Holocene
Slip Rate: Between 2.5 and 3.0 mm/year
Interval between Major Ruptures: Unknown
Probable Magnitudes: M6.0 - 7.2
Other Notes: The Whittier fault dips toward the northeast.

FIGURE 16: WHITTIER M6.8 FAULT SCENARIO



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

FIGURE 17: RSCCD IMPACT FROM A M6.8 WHITTIER FAULT



USGS ShakeMap for the M6.8 Scenario Earthquake on the Whittier Fault: Peak Ground Acceleration
MMI ENGINEERING

TABLE 14: RSCCD SITE IMPACT FROM A M6.8 WHITTIER FAULT

Site	District Location	Peak Ground Acceleration	Modified Mercalli Intensity	Perceived Shaking	Potential Damage
1	District Operations Center	0.1 – 0.2g	VI	Strong	Light
2	Santa Ana College (SAC)	0.1 – 0.2g	VI	Strong	Light
3	Santiago Canyon College (SCC)	0.2 – 0.3 g	VII	Very Strong	Moderate
4	Centennial Education Center (CEC)	0.1 – 0.2g	VI	Strong	Light
5	Orange Education Center (OEC)	0.2 – 0.3 g	VII	Very Strong	Moderate
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	0.1 – 0.2g	VI	Strong	Light
8	Digital Media Center (DMC)	0.1 – 0.2g	VI	Strong	Light

Highlighted sites are the most heavily impacted sites

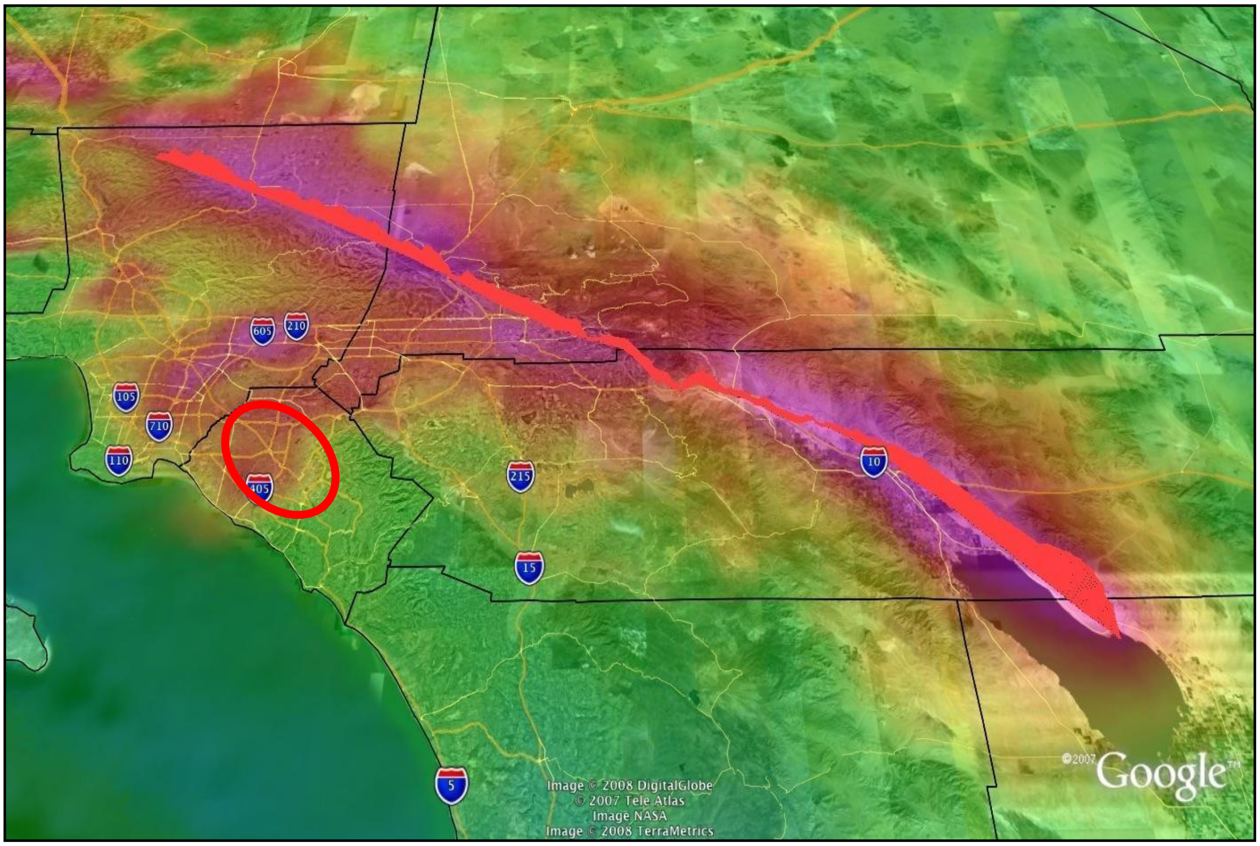
SAN ANDREAS FAULT ZONE

The dominant active fault in California, it is the main element of the boundary between the Pacific and North American tectonic plates. The longest and most publicized fault in California, it extends approximately 650 miles from Cape Mendocino in northern California to east of San Bernardino in southern California, and is approximately 35 miles northeast of Orange County. This fault was the source of the 1906 San Francisco earthquake, which resulted in some 700 deaths and millions of dollars in damage. It is the southern section of this fault that is currently of greatest concern to the scientific community. Geologists can demonstrate that at least eight major earthquakes (Richter magnitude 7.0 and larger) have occurred along the Southern San Andreas Fault in the past 1200 years with an average spacing in time of 140 years, plus or minus 30 years. The last such event occurred in 1857 (the Fort Tejon earthquake). Based on that evidence and other geophysical observations, the Working Group on California Earthquake Probabilities (SCEC, 1995) has estimated the probability of a similar rupture (M7.8) in the next 30 years (1994 through 2024) to be about 50%. The range of probable Magnitudes on the San Andreas Fault Zone is reported to be 6.8 - 8.0.

In Orange County, large urban fires and some wildland fires have been predicted. Major breaks in water lines are expected to seriously impede firefighting operations. Fire stations, police stations, City and School District Emergency Operations Centers may be damaged and unusable slowing coordination of response resources. The 2008 ShakeOut Report by Scawthorn states: The spread of fire within the built environment could be limited to several city blocks. However, of concern are fires in Orange County and the central Los Angeles basin, where a large plain of relatively uniform dense low-rise buildings provides a fuel bed such that dozens to hundreds of large fires are likely to merge into dozens of conflagrations. These fires could destroy tens of city blocks, and several of these large fires could merge into one or several super conflagrations that could destroy hundreds of city blocks.

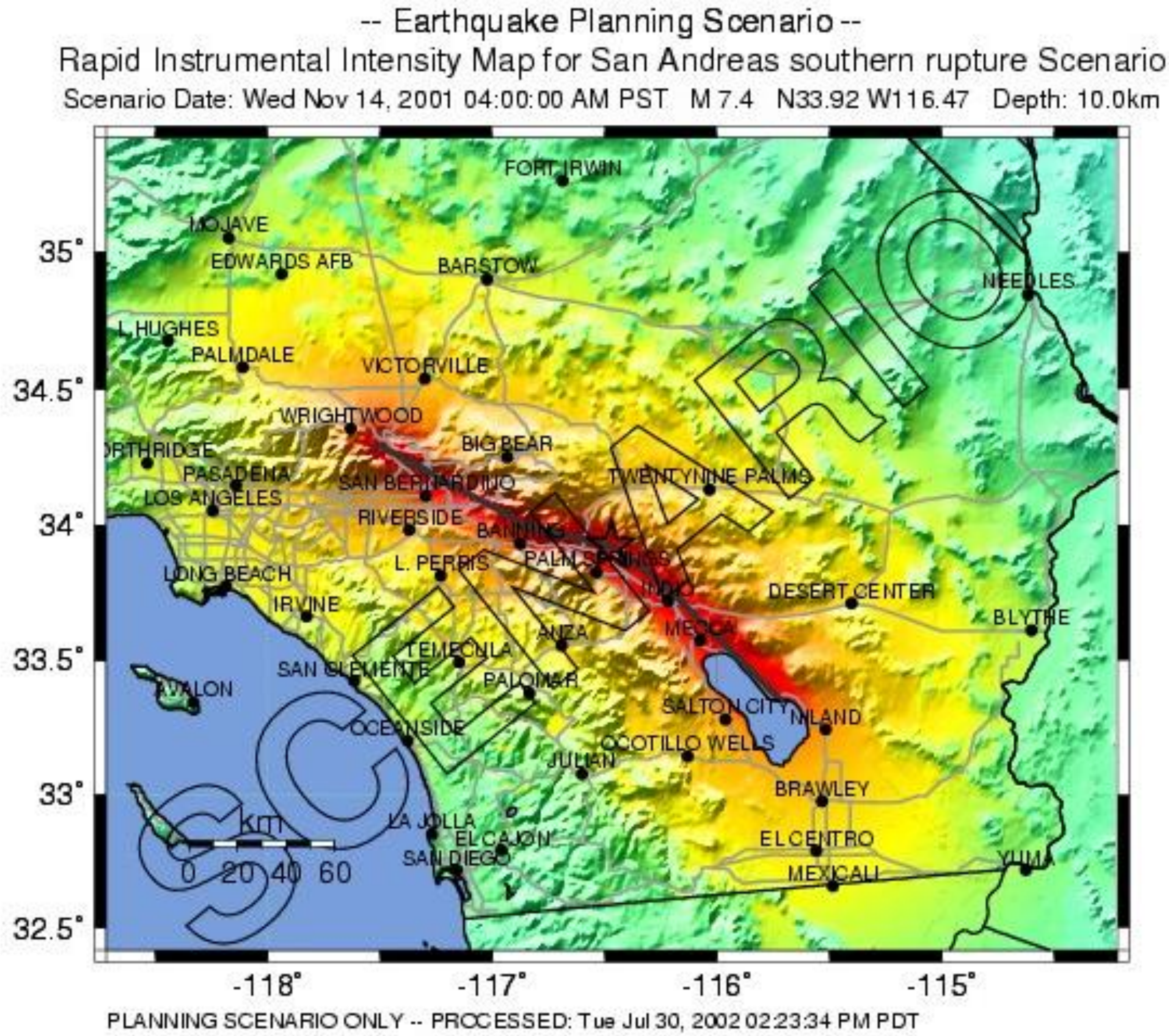
SHAKEOUT REPORT BY SCAWTHORN

FIGURE 18: M7.8 SAN ANDREAS – REPEAT OF THE 1857 FORT TEJON



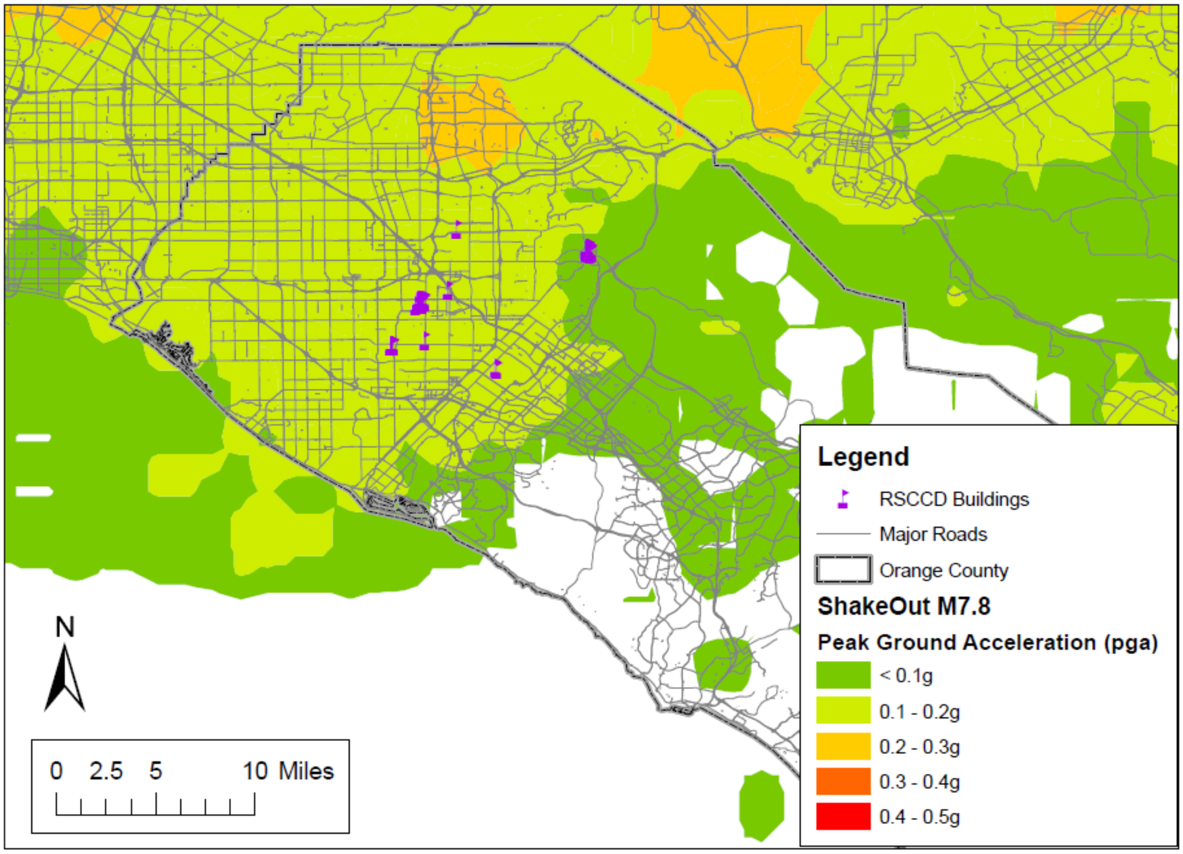
USGS

FIGURE 19: SHAKEMAP M7.4 SOUTHERN SAN ANDREAS SCENARIO (USGS, 2001)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

FIGURE 20: RSCCD IMPACT SCENARIO M7.8 "SHAKEOUT" SO. SAN ANDREAS FAULT



USGS ShakeMap for the M7.8 "ShakeOut" Scenario on the Southern San Andreas Fault: Peak Ground Acceleration

MMI ENGINEERING

TABLE 15: RSCCD SITE IMPACT FROM A M7.8 SOUTHERN SAN ANDREAS FAULT

Site	District Location	Peak Ground Acceleration	Modified Mercalli Intensity	Perceived Shaking	Potential Damage
1	District Operations Center	0.1 – 0.2g	VI	Strong	Light
2	Santa Ana College (SAC)	0.1 – 0.2g	VI	Strong	Light
3	Santiago Canyon College (SCC)	‹0.1 g	V	Moderate	Very Light
4	Centennial Education Center (CEC)	0.1 – 0.2g	VI	Strong	Light
5	Orange Education Center (OEC)	0.1 – 0.2g	VI	Strong	Light
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	0.1 – 0.2g	VI	Strong	Light
8	Digital Media Center (DMC)	0.1 – 0.2g	VI	Strong	Light

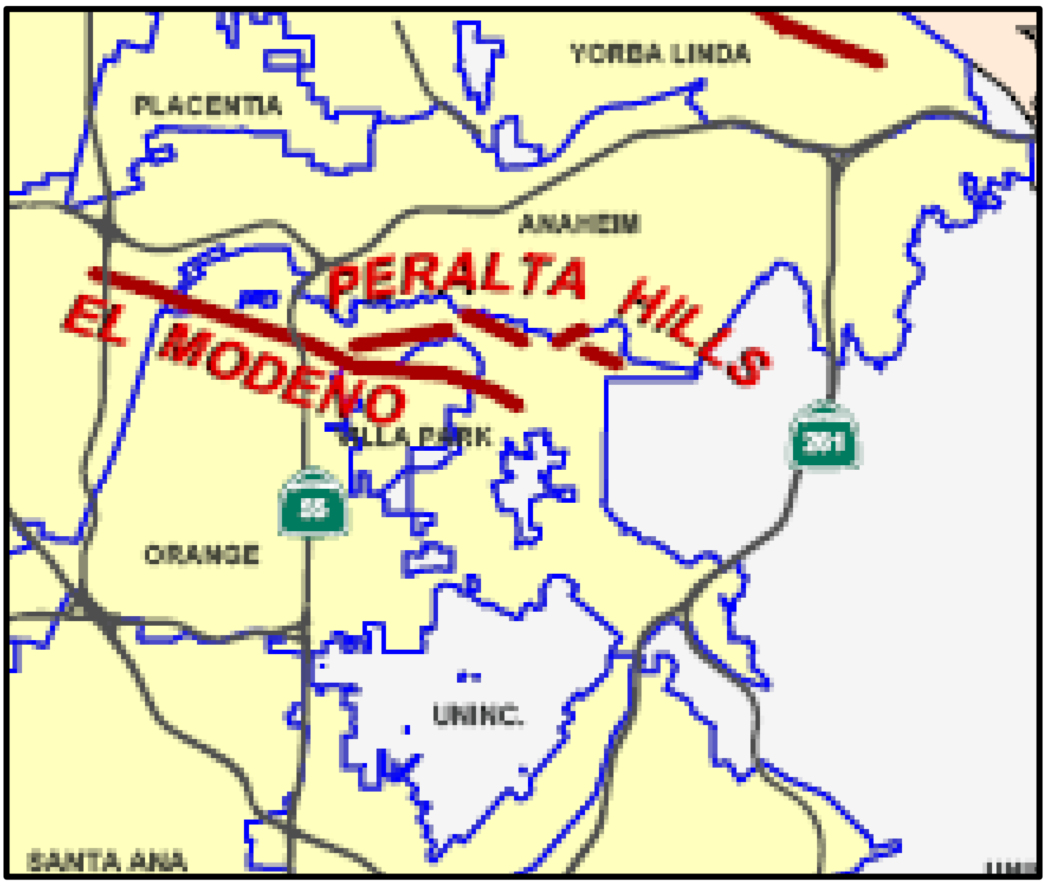
Highlighted sites are the most heavily impacted sites

EL MODENO FAULT

Not a lot is known about the El Modeno Fault. Lisa B. Grant, PhD at UCI conducted the Active Deformation and Earthquake Potential of Southern Los Angeles Basin, Orange County, CA.

ASHBY, JAMES R., Mission Geoscience, Inc., Newport Beach, CA, and BROOKS R. SMITH, LSA Associates, Inc., Irvine, CA writes in the abstract on The El Modeno Fault in Orange County, California: New Evidence for Holocene Activity

FIGURE 21: EL MODENA FAULT MAP



The El Modeno fault in north-central Orange County has long been suspected of being active in accordance with the guidelines of the Alquist-Priolo Special Studies Zones Act of 1972. The El Modeno fault was uncovered during a preliminary geotechnical investigation for a proposed shopping center development just south of the intersection of Chapman Avenue and Newport Boulevard in the City of Orange. Topsoil observed within the shear zone of the fault appeared to be visibly offset. As a result of this discovery, an Alquist-Priolo fault investigation was initiated, involving fault trenches excavated across the site. Close examinations of the fault trace exposed in the trenches conclusively showed that the surficial soil horizon was truncated. Previous geologic and geotechnical investigations in the vicinity of the site have failed to document undisputed evidence for Holocene activity (truncated geologic units proven to be less than 11,000 year old) along the El Modeno fault. This lack of previous conclusive evidence is perhaps due in part to the general lack of datable organic material in Holocene soil horizons, and the distribution of displaced materials over a broad zone, a trait characteristic of reverse/right-lateral strike-slip displacement such as that along the El Modeno fault. Carbon-14 radiometric dating of the truncated soils revealed that surficial soils at this site are less than 2500 years old. Thus, the El Modeno fault should be considered active in accordance with the present guidelines of the Alquist-Priolo Special Studies Act.

The potential zoning of this fault through urbanized areas of Orange County will undoubtedly create some zoning restrictions and may have implications for future planning and redevelopment activities in the area. Earthquakes, such as the 1992 Landers, California, have provided us with interesting insight into the behavior of fault ruptures through both urbanized and unimproved land. Additionally, examination of the behavior of the Landers rupture may have serious implications for our interpretation of expected fault kinematics along faults with similar types of displacements directly related to the El Modeno fault, such as the Peralta Hills thrust and the Whittier-Elsinore fault zone.

AAPG Search and Discovery Article #90992©1993 AAPG Pacific Section Meeting, Long Beach, California, May 5-7, 1993.

EL MODENO FAULT/from Caltrans study in 2007
The El Modeno fault is located east of the study area within the Peralta Hills area of Orange County. The El Modeno fault is a southwest-dipping, north/south trending, normal fault that extends from the Peralta Hills area south into Santiago Creek in the Peters Canyon Wash, approximately 6.5 kilometers (four miles) northeast of the SR-22. This fault may be capable of an earthquake of magnitude 6.0 on the Richter scale (SCEDC, 2000).

El Modeno Fault   So CA Earthquake Data Center
Type of Fault: reverse
Length: about 10 km
Nearest Communities: Anaheim, Orange
Most Recent Surface Rupture: Quaternary

Cenozoic Era
The Cenozoic Era is the current and most recent of the three Phanerozoic geological eras, following and covering the period from 65 million years ago to present day. It began 65 million years ago with an asteroid impact that killed off a majority of the dinosaurs and ends at the present day. The Cenozoic is commonly divided into three periods:
Paleogene (65.5 to 23.03 million years ago)
Neogene (23.03 to 2.6 million years ago)
Quaternary (2.6 million years ago to present)

PERALTA HILLS FAULT

The Peralta Hills Fault is a previously unrecognized active transverse range ‘blind thrust” fault in Orange County, California.

The Peralta Hills fault is an east-west a "blind thrust” except where it surfaces as a low angle thrust in Anaheim Hills. Two tree stumps radiocarbon dated at 3,500 years BP (Fife and Bryant, 1983), have been displaced 15 m. in the lower plate of the fault. Many structures have been constructed on or near the trace or multiple traces of this active fault as a result of the failure to place the Peralta Hills fault in an Earthquake Hazard Studies Zone.

When the California Geological Survey contracted with the U.S. Geological Survey to digitize their Geological/Landslide Hazard Map of the Orange Quad (Tan, 1995) the Survey “moved” the Peralta Hills fault trace “around” Reservoir 1-A, a 5 million gallon semi-buried hillside steel tank and apparently through or adjacent to a second buried hillside 3.500 gallon steel tank .

The Orange City Department of Public Works continues to fill the 5 million gallon tank, possibly jeopardizing down slope structures should the fault rupture. The fault trace forms a perfect diameter through the middle of the 200-foot diameter tank with differential settlement along the contact with Holocene gravels and Miocene siliceous shale. The fault passes through portions of the Edison Serrano Substation and a key transmission tower atop the upper plate and will likely sustain damage during a major earthquake. The fault passes through a gas station and Eisenhower Lake above commercial and residential structures.

Many homes in Anaheim Hills are set back from the fault trace to avoid fault rupture, while other homes are built on areas where multiple thrust fault traces and thrust fault-rooted landslides have been buried. The 15 m set-back from the fault trace that is commonly required for structures may not be sufficient when a low angle thrust passes less than 15 m. beneath the structure.

The Peralta Hills fault has a known sinuous trace of about 10 km. The fault consists, in some locations; of multiple imbricate thrusts. Based on fault length it is estimated that the Peralta Hills fault is capable of a 6 to 7 magnitude earthquake and several meters of left oblique surface rupture.

FIFE, Donald L., Donald L. Fife & Associates, Box 1054, Tustin, CA 92781-1054, donfife@dslextreme.com and SHLEMON, Roy, Geology, UC Davis, One Shields Ave, Davis, CA 95616

PUENTE HILLS THRUST FAULT

This is another recently discovered blind thrust fault that runs from northern Orange County to downtown Los Angeles. This fault is now known to be the source of the 1987 Whittier Narrows earthquake. Recent studies indicate that this fault has experienced four major earthquakes ranging in Magnitude from 7.2 to 7.5 in the past 11,000 years, but that the recurrence interval for these large events is on the order of several thousand years.

HISTORIC EARTHQUAKES

Whittier Narrows, California October 01, 1987, Magnitude 5.9

The Whittier Narrows earthquake caused eight fatalities, injured several hundred, and left property damage estimated at $358 million in the East Los Angeles area, mainly at Whittier. The Modified Mercalli intensity VII to VIII covered an area of about 500 km2 from Monrovia and Pasadena in the north to beyond Whittier in the southeast. MM Intensity VI was assigned to an additional area of 1,500 km2. It was originally thought to be on the Whittier Fault.

Business structures in the old Whittier commercial district were the most severely damaged by the main earthquake. In the 24-square-block shopping area known as Whittier Village, 12 commercial buildings had to be razed, and another 20 buildings were declared unsafe. An inspection of residential houses in Los Angeles, Orange, and Ventura Counties indicated that 123 single-family houses and 1,347 apartment units were destroyed, and about 513 single-family houses and 2,040 apartment units sustained major damage. Property damage on the UCLA campus (about 10 km west of the epicenter) was estimated at more the $20 million.

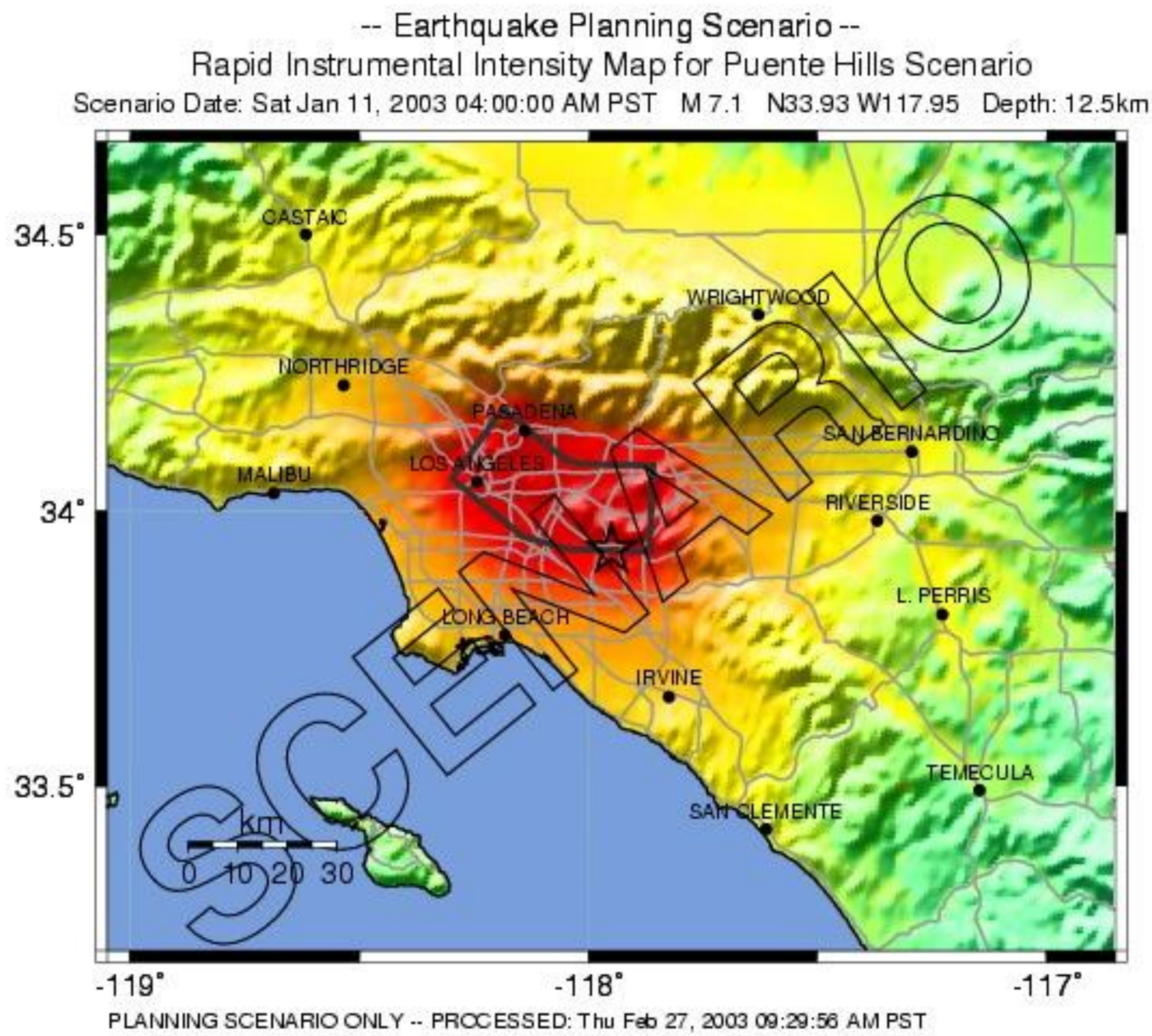
The most severe damage to transportation systems was the Interstate 605 Interstate 5, a major nine-span bridge that was built in 1964. The five supporting columns sustained severe shear fractures and the overpass was closed temporarily. Minor damage also occurred on 23 other bridges in the area.

Damage and dysfunction of lifelines included the often observed failure of ceramic elements on high-voltage substation equipment, damage to large liquid-storage tanks, and saturation of the telephone system with inappropriate calls. The natural-gas transmission system was not damaged, and only one cast-iron pipe failed in the distribution system. However, about 1,400 gas leaks occurred on customer property, and many fires were ignited.

This earthquake sequence ruptured a small and previously unidentified, gently north-dipping, west-striking thrust fault beneath the uplifted Puente Hills and Elysian Park-Montebello Hills. However, tectonic slippage was not observed during a field study of the faults in the epicenter area. Geologic surface expression appeared to be limited to secondary nontectonic breaks caused by acceleration at the surface. Although many ground cracks formed along the base of the Puente Hills between Turnbull Canyon and Norwalk Boulevard, ground breakage in that area was limited to slope failures, including extensional cracks, minor landslides, and rock falls. Ground-surface cracks also were observed at Worsham Creek oil field and Whittier Narrows golf course.

The main shock was followed by about 500 locatable aftershocks, an unusually small number for an earthquake of this magnitude. The largest aftershock, which occurred on October 4 about three km northwest of the epicenter of the main shock, caused further damage to weakened buildings.

FIGURE 22: SHAKEMAP M7.1 PUENTE HILLS (USGS, 2003)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

F. Earthquake Related Hazards

Ground shaking, landslides, amplification and liquefaction are the specific hazards associated with earthquakes. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude, and the type of earthquake.

Ground Shaking

Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock.

Earthquake Induced Landslides

Earthquake induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy the roads, buildings, utilities, and other critical facilities necessary to respond and recover from an earthquake. Many communities in Southern California have a high likelihood of encountering such risks, especially in areas with steep slopes.

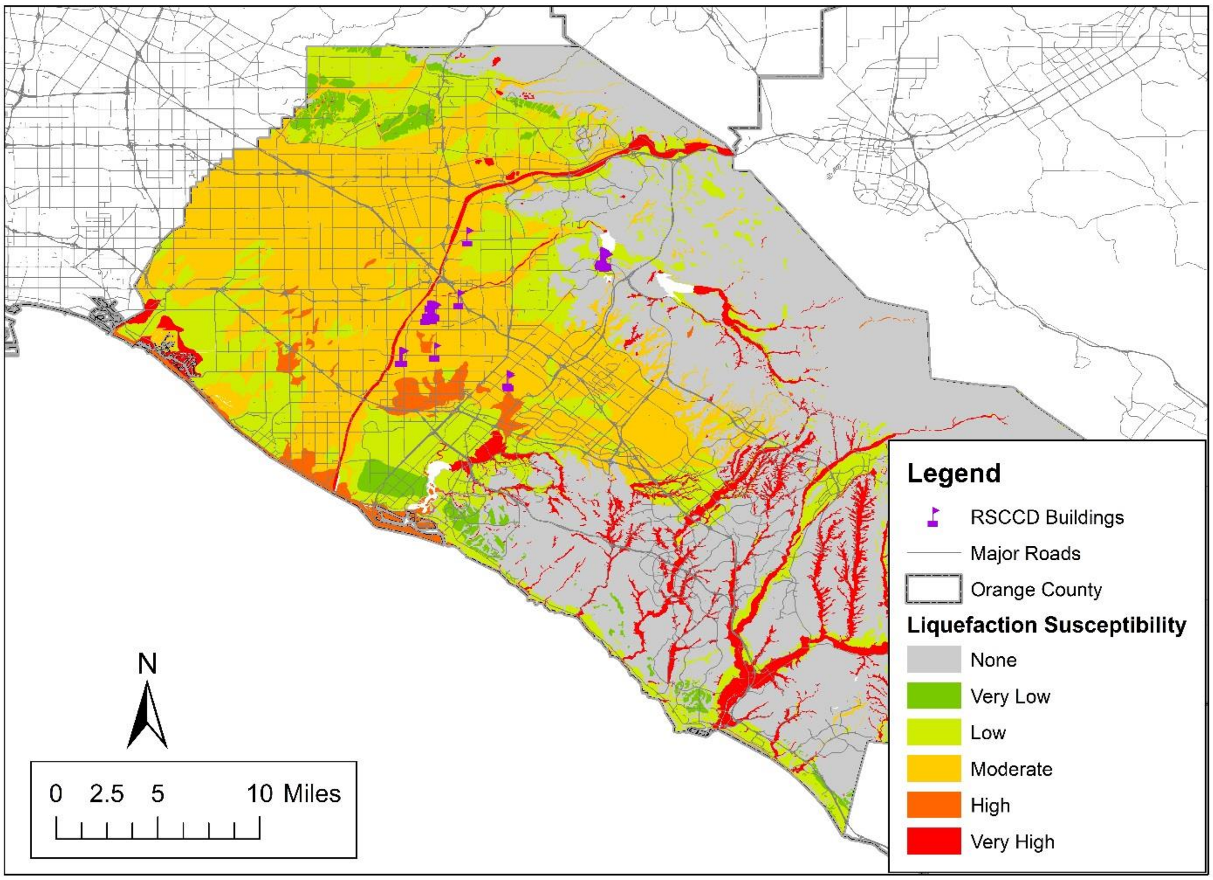
Amplification

Soils and soft sedimentary rocks near the earth's surface can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk. Orange County coastal communities are built on alluvial soils which can increase ground shaking and damage. Amplification can also occur in areas with deep sediment filled basins and on ridge tops.

G. RSCCD Liquefaction Susceptibility

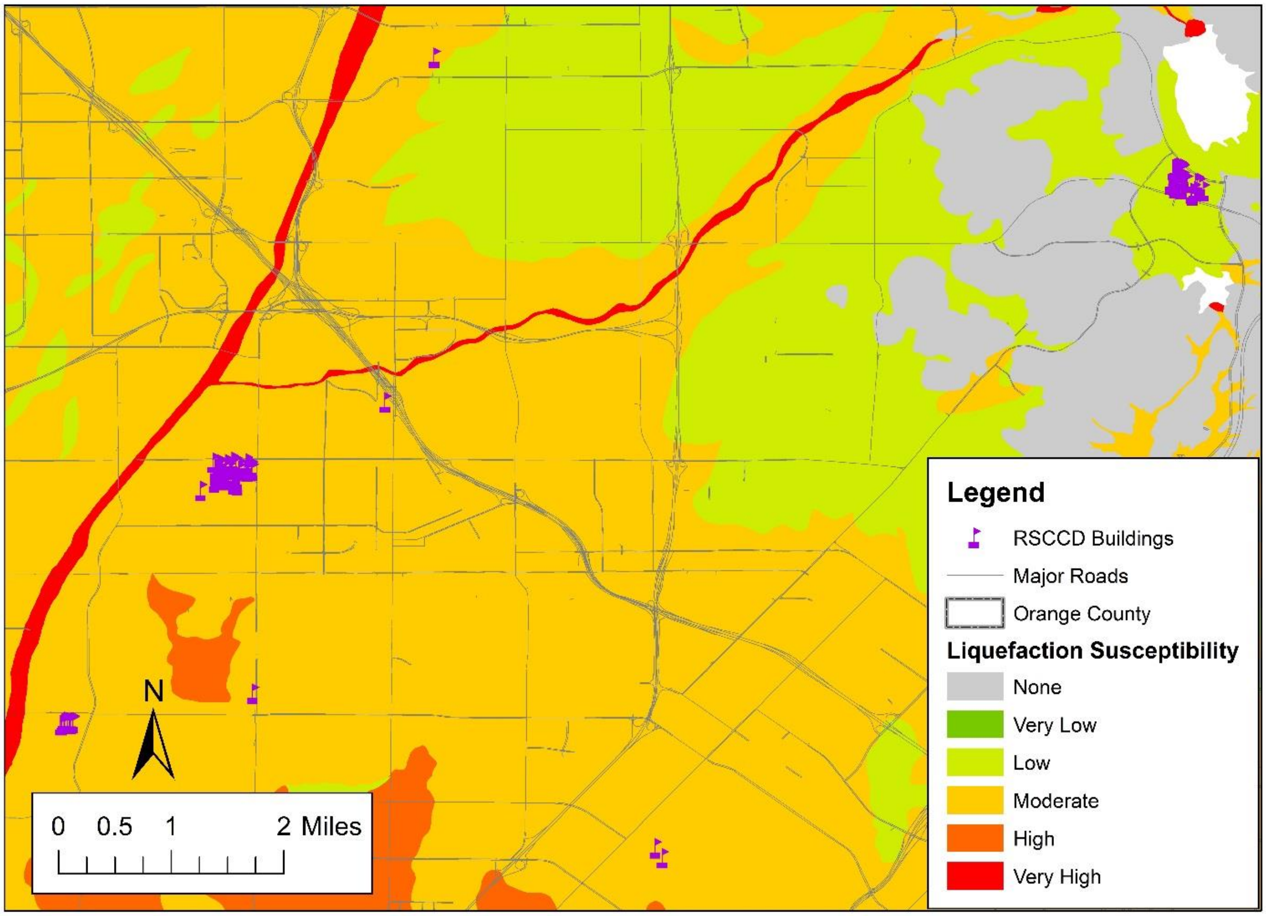
Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures. Many communities in Southern California are built on ancient river bottoms and have sandy soil like the Santa Ana River. In some cases this ground may be subject to liquefaction, depending on the depth of the water table.

Figure 23: Orange County/RSCCD Liquefaction Susceptibility Map



MMI Engineering

FIGURE 24: RSCCD LIQUEFACTION SUSCEPTIBILITY MAP



MMI ENGINEERING

TABLE 16: RSCCD FACILITY EXPOSURE TO LIQUEFACTION SUSCEPTIBILITY

Site	# Buildings	Liquefaction Susceptibility Zone
Centennial Education Center	15	Moderate
Digital Media Center	1	Moderate
District Office	1	Moderate
Orange County Sheriff's Regional Training	2	Moderate
Orange Education Center	1	Moderate
Santa Ana College	76	Moderate
Santiago Canyon College	50	Low
TOTAL	146	

MMI ENGINEERING

H. Community Earthquake Issues

RSCCD Previous Occurrences

Although the RSCCD sites were impacted several moderate and many minor earthquakes, fortunately none of the incidents caused deaths, injuries or heavy financial damage to the RSCCD properties. At the RSCCD sites occupants would have felt the 1987 Whittier Earthquake and the 1994 Northridge Earthquake along with numerous minor earthquakes. The Whittier and Northridge quakes both required evacuation of some facilities in Orange County, damage assessment inspections, and activation of City Emergency Operations Centers (EOCs). In the Northridge Earthquake. there were items off shelves but not facility damage or dollar losses. Both quakes hit early in the morning making it less likely the colleges were impacted. The Northridge earthquake hit on Martin Luther King Day and the sites were not operating.

Susceptibility to Earthquakes

Earthquake damage occurs because humans have built structures that cannot withstand severe shaking. Buildings, airports, schools, and lifelines (highways and utility lines) suffer damage in earthquakes and can cause death or injury to humans. The welfare of homes, major businesses, and public infrastructure is very important. Addressing the reliability of buildings, critical facilities, and infrastructure, and understanding the potential costs to government, businesses, and individuals as a result of an earthquake, are challenges faced by Californians.

Dams

There are a total of 32 dams in Orange County. The ownership ranges from the Federal government to Home Owners Associations. These dams hold billions of gallons of water in reservoirs. The major reservoirs are designed to protect Southern California from flood waters and to store domestic water. Seismic activity can compromise the dam structures resulting in catastrophic flooding. The major dam that could impact the coastal Orange County is the Prado Dam. Following a major earthquake in Southern California, all public safety and school districts should be aware that earthquakes can cause dam failures. The Prado Dam is managed by the Army Corps of Engineers. Following an earthquake, the Army Corps of Engineers will assess the dam for damage and if damaged, issue evacuation orders through the Orange County Sheriffs Department.

On February 9, 1971 at 6:02 AM, the Los Angeles basin shook for over one minute from what was called the San Fernando Earthquake. There were 65 deaths and a financial cost of over $500 million. The earthquake resulted in a crack in the Van Norman Dam where an 80-square mile area had to be evacuated due to fear the dam would break. Scores of people were trapped in buildings and fires were started from natural gas line breaks. Two hospitals collapsed killing nine persons.

Buildings

The built environment is susceptible to damage from earthquakes. Buildings that collapse can trap and bury people. Lives are at risk and the cost to clean up the damage is great. In most California communities, including the County of Orange and the RSCCD sites, many buildings were built before 1993 when building codes were not as strict. In addition, retrofitting is not required except under certain conditions and can be expensive. Therefore, the number of buildings at risk remains high. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of unreinforced masonry buildings.

Infrastructure and Communication

Residents in Orange County commute frequently by automobiles and much less by public transportation such as buses and light rail. An earthquake can greatly damage bridges and roads, hampering emergency response efforts and the normal movement of people and goods. Damaged infrastructure strongly affects the economy of the community because it disconnects people from work, school, food, and leisure, and separates businesses from their customers and suppliers.

Bridge Damage

Even modern bridges can sustain damage during earthquakes, leaving them unsafe for use. Some bridges have failed completely due to strong ground motion. Bridges are a vital transportation link - with even minor damages making some areas inaccessible. Because bridges vary in size, materials, location and design, any given earthquake will affect them differently. Bridges built before the mid-1970's have a significantly higher risk of suffering structural damage during a moderate to large earthquake compared with those built after 1980 when design improvements were made.

Much of the interstate highway system was built in the mid to late 1960's. The bridges in Orange County are state, county or privately owned (including railroad bridges). Cal Trans has retrofitted most bridges on the freeway systems; however, there are still some county maintained bridges that are not retrofitted. The FHWA requires that bridges on the National Bridge Inventory be inspected every 2 years. Caltrans checks when the bridges are inspected because they administer the Federal funds for bridge projects.

Damage to Lifelines
Lifelines are the connections between communities and outside services. They include water and gas lines, transportation systems, electricity and communication networks. Ground shaking and amplification can cause pipes to break open, power lines to fall, roads and railways to crack or move, and radio and telephone communication to cease. Disruption to transportation makes it especially difficult to bring in supplies or services. Lifelines need to be usable after earthquakes to allow for rescue, recovery, and rebuilding efforts and to relay important information to the public.

Disruption of Critical Services
Critical facilities include police stations, fire stations, hospitals, shelters, schools and colleges, and other facilities that provide important services to the community. These facilities and their services need to be functional after an earthquake event.

Nuclear Power Plant Accidents
The March 11, 2011 Japan M9.0 earthquake resulted in three nuclear power plant meltdowns. Following this earthquake, many Californians began asking how a major earthquake would impact their community. Because of this, the Nuclear Regulatory Commission is now reviewing nuclear power plants near earthquake faults and their emergency plans. More information will become available in the future.

The only nuclear power plant that could impact the RSCCD is the San Onofre Nuclear Generating Station located south of Orange County in San Diego County. The site is now in the process of closure, however, all nuclear waste remains on site. Three cities in Orange County would be impacted initially: San Clemente, Dana Point and San Juan Capistrano. The district has no sites in these three cities.

Businesses
Seismic activity can cause great loss to businesses, both large-scale corporations and small retail shops. When a company is forced to stop production for just a day, the economic loss can be tremendous, especially when its market is at a national or global level. Seismic activity can create economic loss that presents a burden to large and small businesses who may have difficulty recovering from their losses.

Forty percent of businesses do not reopen after a disaster and another twenty-five percent fail within one year according to the Federal Emergency Management Agency (FEMA). Similar statistics from the United States Small Business Administration indicate that over ninety percent of businesses fail within two years after being struck by a disaster.

Individual Preparedness
Because the potential for earthquake occurrence and earthquake related property damage may be relatively moderate to high in Orange County, making individual preparedness a significant need. The RSCCD Emergency Response Program teaches employees evacuation procedures and has assigned and trained Building Captains at each of its sites. The District has identified Campus Emergency Operations Centers (EOCs) for each of its sites. (For a complete list, see Risk Assessment Critical Facilities, page 20.)

DEATH AND INJURY
Death and injury can occur both inside and outside of buildings due to collapsed buildings, falling equipment, furniture, debris, and structural and non-structural materials. Downed power lines and broken water and gas lines can also endanger human life.

FIRE
Downed power lines or broken gas mains can trigger fires. When fire stations suffer building or lifeline damage, firefighters may not be able to respond. Furthermore, major incidents will demand a larger share of resources, and initially smaller fires and problems will receive little or insufficient resources in the initial hours after a major earthquake event. Loss of electricity may cause a loss of water pressure in some communities, further hampering firefighting ability. Water main breaks also increases the threat of fire.

Should an earthquake occur during a Santa Ana Wind condition, the threat of fire would increase considerably. This could result in a catastrophic fire that could cause more damage than the earthquake which is what occurred in the 1906 San Francisco Earthquake.

DEBRIS
After damage to a variety of structures, much time is spent cleaning up brick, glass, wood, steel or concrete building elements, office and home contents, and other materials. Developing a strong debris management strategy is essential in post-disaster recovery. Occurrence of a disaster does not exempt Orange County from compliance with AB 939 regulations covering recycling debris.

EXISTING MITIGATION ACTIVITIES
Existing mitigation activities include current mitigation programs and activities that are being implemented by district, city, county, regional, state, or federal agencies or organizations.

BUILDING CODES
Since the RSCCD does not have its own building codes, they must follow the California Division of State Architect (DSA). The RSCCD facilities are located within the two cities of Santa Ana and Orange. Some city coordination may be required on zoning, infrastructure and street issues.

HOSPITALS
"The Alfred E. Alquist Hospital Seismic Safety Act ("Hospital Act") was enacted in 1973 in response to the moderate but damaging Magnitude 6.6 Sylmar Earthquake in 1971 when four major hospital campuses were severely damaged and evacuated. Two hospital buildings collapsed killing forty seven people. Three others were killed in another hospital that nearly collapsed.

In approving the Act, the Legislature noted that: "Hospitals, that house patients who have less than the capacity of normally healthy persons to protect themselves, and that must be reasonably capable of providing services to the public after a disaster, shall be designed and constructed to resist, insofar as practical, the forces generated by earthquakes, gravity and winds." (Health and Safety Code Section 129680)

When the Hospital Act was passed in 1973, the State anticipated that, based on the regular and timely replacement of aging hospital facilities, the majority of hospital buildings would be in compliance with the Act's standards within 25 years. However, hospital buildings are not being replaced at that anticipated rate. In fact, the great majority of the State's urgent care facilities are now more than 40 years old.

The moderate Magnitude 6.7 Northridge Earthquake in 1994 caused $3 billion in hospital-related damage and evacuations. Twelve hospital buildings constructed before the Act were cited (red tagged) as unsafe for occupancy after the earthquake. Those hospitals built in accordance with the 1973 Hospital Act were very successful in resisting structural damage. However, nonstructural damage (for example, plumbing and ceiling systems) was still extensive in those post-1973 buildings.

Senate Bill 1953 ("SB 1953"), enacted in 1994 after the Northridge Earthquake, expanded the scope of the 1973 Hospital Act. Under SB 1953, all hospitals are required, as of January 1, 2008, to survive earthquakes without collapsing or posing the threat of significant loss of life. The 1994 Act further mandates that all existing hospitals be seismically evaluated and retrofitted, if needed, by 2030. SB 1953 applies to all urgent care facilities (including those built prior to the 1973 Hospital Act) and affects approximately 2,500 buildings on 475 campuses.

SB 1953 directed the Office of Statewide Health Planning and Development ("OSHPD"), in consultation with the Hospital Building Safety Board, to develop emergency regulations including "…earthquake performance categories with sub gradations for risk to life, structural soundness, building contents, and nonstructural systems that are critical to providing basic services to hospital inpatients and the public after a disaster." (Health and Safety Code Section 130005) The Seismic Safety Commission Evaluation of the State's Hospital Seismic Safety Policies.

In 2001, recognizing the continuing need to assess the adequacy of policies, and the application of advances in technical knowledge and understanding, the California Seismic Safety Commission created an Ad Hoc Committee to re-examine the compliance with the Alquist Hospital Seismic Safety Act. The formation of the Committee was also prompted by the recent evaluations of hospital buildings reported to OSHPD revealing that a large percentage (40%) of California's operating hospitals are in the highest category of collapse risk."

I. California Earthquake Mitigation Legislation

California is painfully aware of the threats it faces from earthquakes. Dating back to the 19th century, Californians have been killed, injured, and lost property as a result of earthquakes. As the State's population continues to grow, and urban areas become even more densely built up, the risk will continue to increase. For decades, the Legislature has passed laws to strengthen the built environment and protect the residents. The table below provides a sample of State Codes related to earthquakes.

TABLE 17: EARTHQUAKE SAFETY LAWS

Partial List of the Over 200 California Laws on Earthquake Safety	
Government Code Section 8870-8870.95	Creates Seismic Safety Commission.
Government Code Section 8876.1-8876.10	Established the California Center for Earthquake Engineering Research.
Public Resources Code Section 2800-2804.6	Authorized a prototype earthquake prediction system along the central San Andreas fault near the City of Parkfield.
Public Resources Code Section 2810-2815	Continued the Southern California Earthquake Preparedness Project and the Bay Area Regional Earthquake Preparedness Project.
Health and Safety Code Section 16100-16110	The Seismic Safety Commission and State Architect will develop a state policy on acceptable levels of earthquake risk for new and existing state-owned buildings.
Government Code Section 8871-8871.5	Established the California Earthquake Hazards Reduction Act of 1986.
Health and Safety Code Section 130000-130025	Defined earthquake performance standards for hospitals.
Public Resources Code Section 2805-2808	Established the California Earthquake Education Project.
Government Code Section 8899.10-8899.16	Established the Earthquake Research Evaluation Conference.
Public Resources Code Section 2621-2630 2621.	Established the Alquist-Priolo Earthquake Fault Zoning Act.
Government Code Section 8878.50-8878.52 8878.50.	Created the Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990.
Education Code Section 35295-35297 35295.	Established emergency procedure systems in kindergarten through grade 12 in all the public or private schools.
Health and Safety Code Section 19160-19169	Established standards for seismic retrofitting of unreinforced masonry buildings.
Health and Safety Code Section 1596.80-1596.879	Required all child day care facilities to include an Earthquake Preparedness Checklist as an attachment to their disaster plan.
Source: http://www.leginfo.ca.gov/calaw.html	

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J. EARTHQUAKE EDUCATION

Earthquake research and education activities are conducted at several major universities in the Southern California region, including Caltech, USC, UCLA, UCSB, UCI, and UCSD. The local clearinghouse for earthquake information is the Southern California Earthquake Center located at the University of Southern California, Los Angeles, CA 90089, Email: SCEinfo@usc.edu, Website: http://www.scec.org. The Southern California Earthquake Center (SCEC) is a community of scientists and specialists who actively coordinate research on earthquake hazards at nine core institutions, and communicate earthquake information to the public. SCEC is a National Science Foundation (NSF) Science and Technology Center and is co-funded by the United States Geological Survey (USGS).

Orange County, along with other Southern California counties, sponsor the Emergency Survival Program (ESP), an educational program for learning how to prepare for earthquakes and other disasters. Many school districts have very active emergency preparedness programs that include earthquake drills and periodic disaster response team exercises.

The RSCCD works closely with the county and the cities where their facilities are located to coordinate earthquake education and exercises. Examples include: Orange County ShakeOut Earthquake Exercises, annual Orange County Operational Area exercises, and ReadyOC website where Orange County residents and RSCCD students and faculty can find earthquake educational resources. The district personnel can also turn to the American Red Cross for earthquake preparedness information and training as well as for volunteer opportunities to assist in disasters.

The RSCCD has on its website “Safety and Risk Management” where emergency preparedness is discussed, disaster preparedness training classes, fire extinguisher training, and other safety information.

All managers, as part of their professional development, are required to take the National Information Management System (NIMS) on-line courses to prepare to manage incidents in the district’s Emergency Operations Center which would be set up on the first floor district board room, Room 107.

On September 17, 2015 the RSCCD Risk Manager and Security Team set up and operated an emergency preparedness booth at Santiago Canyon Community College. They displayed enlarged hazard maps from the earthquake section of this Hazard Mitigation Plan (in progress).

A sign was displayed inviting students, faculty and staff to join the District's Hazard Mitigation Team.

K. Earthquake Probability of Future Occurrences

A Southern California Earthquake Center (SCEC) report published Seismic Hazards in Southern California stated: Probable earthquakes 1994 to 2024 indicated that the probability of an earthquake of a Magnitude 7 or larger in Southern California before the year 2024 is 80 to 90 percent. The San Andreas Fault is approximately 35 miles northeast of Orange County. This fault is capable of producing earthquakes in the magnitude of 8+ range. It has been scientifically determined through a carbon dating process that a major earthquake on this fault has occurred approximately every 130 years plus or minus 20 years. The last major earthquake on the Southern San Andreas Fault occurred in 1857 (158 years ago as of 2015). The San Andreas is considered one of the most active faults in the world today and located on the Pacific Ring of Fire where most of the world's earthquakes occur. A major earthquake up to an 8.3 magnitude is expected to occur again within the next 20 years.

There are still undiscovered faults throughout California. An example of that is the San Joaquin Hills Fault, was only discovered in 1999. One of these undiscovered faults could cause an earthquake that impacts the RSCCD.

The following provides us an historic view of the faults that would most impact the RSCCD and the intervals between major ruptures. Intervals can be between hundreds and thousands of years.

Table 18: Earthquake Recurrence Intervals

Fault	Magnitude	Last Major Earthquake	Earthquake Recurrence Intervals
San Joaquin Hills	M6.6	Possibly 1769	The minimum average recurrence interval is between about 1650 and 3100 years
Newport-Inglewood	M6.9	1933	The Newport-Inglewood fault has an unknown interval between major ruptures. However, the recurrence interval for a similar quake of the M6.4 1933 Long Beach quake is once every 1000 years.
Whittier	M6.8	Unknown	The recurrence interval is unknown for the Whittier fault.
San Andreas	M7.8	1857	Every 150 years. The probability of a M7.8 rupture in the next 30 years (1994 through 2024) is about 50%
El Modeno	M6.0	Unknown	The recurrence interval is unknown for the El Modeno fault.
Puente Hills	M7.1	1987	The recurrence interval for large events is on the order of several thousand years

L. Summary of Data

This section summarizes and compares the impact of each of the five earthquake faults with each other where data is available and will help the Hazard Mitigation Team, district personnel, faculty, students and the public to understand the potential impact of earthquake on the RSCCD facilities.

Table 19: RSCCD Sites Modified Mercalli Intensity Rankings by Site

#	Site	San Joaquin Hills	Newport-Inglewood	Whittier	San Andreas
1	District Operations Center	VII	VI	VI	VI
2	Santa Ana College (SAC)	VIII	VII	VI	VI
3	Santiago Canyon College (SCC)	VII	VI	VII	V
4	Centennial Education Center (CEC)	VIII	VII	VI	VI
5	Orange Education Center (OEC)	VII	VI	VII	VI
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	VIII	VII	VI	VI
8	Digital Media Center (DMC)	VIII	VII	VI	VI

Worse threats are highlighted

The worst-case scenario for the RSCCD is the San Joaquin Hills Fault where four sites are expected to have severe shaking and moderate to heavy damage, and VIII on the Modified Mercalli Scale.

The next worst-case scenario is the Newport Inglewood Fault where four sites are expected to have very strong shaking, moderate damage and a VII on the Modified Mercalli Scale.

The third worst-case scenario is the Whittier Fault where two sites are expected to have very strong shaking, moderate damage and a VII on the Modified Mercalli Scale.

Surprisingly, in the San Andreas scenario which has the greatest potential of occurring, the shaking is expected to be strong but the damage fortunately is expected is to be light.

This information is not available for the El Modeno or Puente Hills faults.

Note: The RSCCD 2015 Insurance Property Evaluation Report (completed every 5 years) referenced in this plan can be accessed through the RSCCD Risk Management Department Office.

TABLE 20: HAZUS ESTIMATED IMPACTS - RSCCD FACILITIES (IN $1,000) BY SITE

Damage Type	RSCCD Sites							
	District Office	Santa Ana College	Centennial Education Center	Digital Media Center	Orange Education Center	Santiago Canyon College	OC Sheriff's Regional Training	Total
M6.9 Newport-Inglewood Fault Scenario Earthquake								
Structural Damage	135	973	57	74	75	89	96	1,498
Non-Str. Damage	370	7,690	551	446	307	1,253	847	11,463
Building Damage (Str+Non-Str.)	505	8,663	608	520	382	1,342	942	12,962
Net Damage Ratio	3.4%	6.4%	7.6%	7.6%	2.2%	1.3%	7.0%	4.3%
Contents Damage	27	993	58	128	0	170	85	1,462
Total Building & Contents Damage	***532***	***9,656***	***665***	***648***	***382***	***1,513***	***1,028***	***14,423***
M6.6 San Joaquin Hills Fault Scenario Earthquake								
Structural Damage	265	1,976	101	125	208	224	175	3,074
Non-Str. Damage	762	14,441	955	762	894	2,714	1,524	22,052
Building Damage	1,027	16,417	1,056	887	1,102	2,938	1,698	25,126
Net Damage Ratio	7.0%	12.0%	13.2%	12.9%	6.3%	2.8%	12.5%	8.4%
Contents Damage	56	1,786	99	222	0	468	156	2,788
Total Building & Contents Damage	***1,083***	***18,204***	***1,155***	***1,109***	***1,102***	***3,405***	***1,855***	***27,914***
M6.8 Whittier Fault Scenario Earthquake								
Structural Damage	99	578	7	13	211	303	16	1,226
Non-Str. Damage	300	4,727	101	86	904	3,441	165	9,725
Building Damage	399	5,305	109	98	1,115	3,744	180	10,951
Net Damage Ratio	2.7%	3.9%	1.4%	1.4%	6.3%	3.6%	1.3%	3.6%
Contents Damage	23	617	11	26	0	537	18	1,232
Total Building & Contents Damage	***423***	***5,922***	***120***	***124***	***1,115***	***4,282***	***198***	***12,183***

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No financial data is available at this time for the Whittier or El Modeno Faults.

The estimated total building and contents damage for the 6.9 magnitude on the Newport-Inglewood Fault is $14,423,000.

The estimated total building and contents damage for the 6.6 magnitude on the San Joaquin Hills Fault is $27,914,000. This is the worst case scenario.

The estimated total building and contents damage for the 6.8 magnitude on the Whittier Fault is $12,183,000.

As shown above, according to MMI Engineering: the earthquake scenario causing the largest economic loss is the M6.6 San Joaquin Hills Fault scenario, which could result in just under $28 million in building and content damage to the 146 buildings modeled for the District. The M6.9 Newport-Inglewood Fault and the M6.8 Whittier Fault scenarios would both cause about half this amount of damage or less, on the order of $14 million and $12 million, respectively. Fortunately the expected damage is modest; all of the RSCCD buildings are expected to be "green-tagged" (may have suffered some damage, but continued occupancy is allowed) in the three events studied. While the net damage ratio for the District is expected to range between 4 and 8% of building replacement value in the three events, maximum expected individual building damage ratios' could be as large as 16% in the San Joaquin Hills event, 8% in the Newport-Inglewood event and 6% in the Whittier event.

Most of the damage is expected to be non-structural in nature with non-structural damage accounting for just under 90% of building damage in all three events. Non-structural components commonly include non-bearing walls and partitions, veneers and finishes, mechanical and electrical building systems and equipment, HVAC system, lighting fixtures, suspended ceiling systems, etc. Non-structural mitigation such as conducting a non-structural component survey resulting in anchorage and bracing recommendations would be a valuable way for the District to reduce potential earthquake damage.

The total number of expected casualties in each event (including both non-fatal and fatal injuries), as well as overall casualty rates are summarized by site in the following table. The earthquake scenario causing the greatest number of casualties is the San Joaquin Hills Fault scenario earthquake, which could cause between 250-200 non-fatal injuries (most occurring on the Santa Ana College campus) and could potentially cause as many as 15 deaths.

It should be noted that high occupancy facilities, even when moderately damage, may generate more casualties than buildings with lower occupancy levels. To better understand the range of vulnerability to casualties, casualty data in Table 23 (below) are presented in terms of both the number of expected casualties, and the expected casualty rates. As shown in the table below, the site with the largest number of expected casualties in all three events is Santa Ana College; the site which also has the highest daytime peak population levels (14,925). Buildings with the largest injury and/or fatality rates would be considered the most dangerous to their occupants. Although the actual number of expected fatalities at the Orange Education Center in the San Joaquin Hills scenario is smaller than that for Santa Ana College, the fatality rate at this facility is the same order of magnitude as Santa Ana College as a whole. Further, this facility has a higher fatality rate than Santa Ana College in the Whittier event. The individual buildings with non-zero injury and fatality estimates are identified in Table 24, along with each building's peak daytime occupancy, demonstrating that many of the buildings on the list are high occupancy facilities. Buildings that also have non-zero fatality estimates have been highlighted in red for the scenario in which the non-zero rate occurs. A total of 41 buildings could have injured occupants in the San Joaquin Hills scenario event, while 32 and 23 buildings could have injured occupants in the Newport-Inglewood and Whittier scenarios respectively. For each of these buildings, the assumed building characteristics should be verified. To reduce potential risk to building occupants, these especially those of higher occupancy levels or higher injury or fatality rates, as shown in Appendix ? would be good candidates for structural review and evaluation.

TABLE 21: HAZUS-ESTIMATED CASUALTIES FOR RSCCD FACILITIES BY SITE

Name	RSCCD Sites							
	District Office	Santa Ana College	Centennial Education Center	Digital Media Center	Orange Education Center	Santiago Canyon College	OC Sheriff's Regional Training	Total
M6.9 Newport-Inglewood Fault Scenario								
Expected Injuries	≤ 5	50 - 75	6 - 10	≤ 5	≤ 5	≤ 5	≤ 5	75 - 100
Expected Fatalities	None	≤ 5	None	None	None	None	None	≤ 5
Expected Injury Rate	<1%	~1%	<1%	~1%	<1%	<1%	~1%	<1%
Expected Fatality Rate	None	~0.02%	None	None	None	None	None	~0.01%
M6.6 San Joaquin Hills Fault Scenario								
Expected Injuries	≤ 5	100 - 150	11 - 20	≤ 5	6 - 10	6 - 10	≤ 5	150 - 200
Expected Fatalities	None	6 - 10	None	None	≤ 5	None	None	11- 15
Expected Injury Rate	~1%	~1%	~1%	1 – 2%	<1%	<1%	1 – 2%	1%
Expected Fatality Rate	None	~0.06%	None	None	~0.06%	None	None	~0.04%
M6.8 Whittier Fault Scenario								
Expected Injuries	≤ 5	25 - 50	None	None	6 - 10	6 - 10	None	50 - 75
Expected Fatalities	None	≤ 5	None	None	≤ 5	None	None	≤ 10
Expected Injury Rate	<1%	<1%	None	None	<1%	<1%	None	<1%
Expected Fatality Rate	None	~0.1%	None	None	~0.6%	None	None	~0.1%

MMI ENGINEERING TABLE

TABLE 22: BUILDINGS WITH NON-ZERO INJURY ESTIMATES/RATES BY SCENARIO

Highlighted entries below indicate buildings that have non-zero fatality rates. They are the buildings we need to be most concerned about and should be considered for structural engineering evaluation, especially the higher occupancy buildings

Building Name	Peak Occupancy	M6.9 Newport-Inglewood	M6.6 San Joaquin Hills	M6.8 Whittier
District Office - Admin Building	399	☑	☑	☑
SAC - Administration Building	231	☑	☑	☑
SAC - Cesar Chavez Building	1,236	☑	☑	☑
SAC - Fine Arts Building	414	☑	☑	☑
SAC - Music Building	179	☑	☑	
SAC - Theater Building	575	☑	☑	☑
SAC - Dunlap Hall Building	1,636	☑	☑	☑
SAC - Planetarium Building	127	☑	☑	
SAC - Library Building	958	☑	☑	☑
SAC - Russell Hall Building	1,293	☑	☑	☑
SAC - Hammond Hall Building	452	☑	☑	☑
SAC - Technical Arts Building	254	☑	☑	☑
SAC - Women's PE Building	227	☑	☑	☑
SAC - Gymnasium Building	2,535	☑	☑	☑
SAC - Lockers Building *	136	☑	☑	
SAC – Fitness Center	84		☑	
SAC - Campus Center Building	727	☑	☑	☑
SAC - Auto Shop Building	159	☑	☑	
SAC - Maintenance and Publication	159	☑	☑	
SAC - Welding/Maintenance	112	☑	☑	
SAC - Classroom Building I	725	☑	☑	☑
SAC - Middle School (Business/Computer) Bldg	480	☑	☑	☑
SAC - Child Development Building 100	126	☑	☑	
SAC - Child Development Building 300	96		☑	
SAC - Child Development Building 400	96		☑	
CEC - Admin/Classroom Building A Wing	265	☑	☑	
CEC - Classroom Building B Wing	200	☑	☑	
CEC - Child Development Building C Win	223	☑	☑	
CEC - Art Building D Wing	316	☑	☑	
CEC - TV Studio/Classroom Building E W	189	☑	☑	
CEC - Classroom Building F Wing	261	☑	☑	
CEC – Portable Classroom	92		☑	
Digital Media Center	283	☑	☑	
Orange Education Center	1,600	☑	☑	☑
SCC – Classroom Building B	529			☑
SCC – Lecture Hall/Classroom Building	999		☑	☑
SCC – Admin/Office/Classroom Building	675		☑	☑
SCC - Library	661		☑	☑
SCC – Science Center	918		☑	☑
SCC - Physical Education Building	2,438	☑	☑	☑
SCC – Humanities Building	1,560		☑	☑
OCSRT - Administration/Training Academy	304	☑	☑	
	24,929	32 buildings	41 buildings	23 buildings

MMI ENGINEERING TABLE

* CURRENT DATA WERE UNAVAILABLE

It should be noted that buildings designed to older versions of the building code tend to be more vulnerable to damage than equivalent buildings designed to more recent codes. The District has a number of these older buildings on the Santa Ana College Campus, and including the District Office. The 23 buildings currently modeled in HAZUS as designed to a "Moderate Code" level (built between 1941 and 1976, i.e., prior to the release of the 1976 Uniform Building Code) are identified in **Table 24** below. These buildings house close to 110,000 occupants and would be good candidates for structural engineering evaluation, especially the higher occupancy buildings, many of which appear in the list of buildings with non-zero injury estimates below.

TABLE 23: "MODERATE CODE" BUILDINGS DESIGN LEVELS IN HAZUS

Site/Building Number from 2015 Insurance Appraisal Report	Site – Building Name	Year Built	Peak Daytime Occupancy
Site 1 Building 01	District Office - Admin Building	1970	399
Site 2 Building 01	SAC - Administration Building	1972	231
Site 2 Building 03	SAC - Fine Arts Building	1972	414
Site 2 Building 04	SAC - Music Building	1970	179
Site 2 Building 05	SAC - Theater Building	1955	575
Site 2 Building 06	SAC - Dunlap Hall Building	1973	1,636
Site 2 Building 07	SAC - Planetarium Building	1967	127
Site 2 Building 08	SAC - Library Building	1956	958
Site 2 Building 09	SAC - Russell Hall Building	1967	1,293
Site 2 Building 10	SAC - Hammond Hall Building	1954	452
Site 2 Building 11	SAC - Technical Arts Building	1970	254
Site 2 Building 12	SAC – Wrestling Room	1972	227
Site 2 Building 13	SAC - Gymnasium Building	1954	2,535
Site 2 Building 15	SAC - Fitness Center	1972	84
Site 2 Building 18	SAC - Auto Shop Building	1958	159
Site 2 Building 19	SAC - Maintenance And Publication	1950	159
Site 2 Building 20	SAC - Campus Vehicles Building	1950	10
Site 2 Building 21	SAC - Welding/Maintenance	1958	112
Site 2 Building 25	SAC - Maintenance Storage Building	1950	10
Site 2 Building 26	SAC - Mechanical Pool Building	1947	1
Site 2 Building 28	SAC - Office/Storage Building	1947	10
Site 2 Building 32	SAC - Pool Equipment Building	1947	1
			9,826

MMI ENGINEERING TABLE UPDATED (BUILDING 14/LOCKER BLDG. REMOVED -REBUILT IN 2009)

M. Conclusions and Recommendations

As described in the MMI Engineering HAZUS study: the Rancho Santiago Community College District's facilities could suffer as much as $28 million in damage to the buildings and their contents in the San Joaquin Hills scenario earthquake and between $12 and $14 million in the two other scenario events modeled. Much of this damage is expected to be non-structural in nature. To minimize this type of damage and its effects on operations, the District could conduct detailed non-structural evaluations of their facilities, in order to identify and mitigate potentially vulnerable non-structural components and systems.

The results of the current study may be used to identify and prioritize other mitigation activities, including recommending the "Moderate Code" buildings at the Santa Ana College campus and the District Office (Table 24), and those buildings representing a higher life-safety risk to their occupants (Table 23) as potential candidates for detailed engineering evaluations (if such studies do not exist or are out of date), design of building strengthening or retrofit recommendations, as necessary, and implementation of such retrofit activities.

A large number of loss estimates have been produced in the current study; detailed building level results are provided in the Appendices. Every effort has been made to accurately classify each building's structural system and design level from available data in the Appendices. For buildings where the current categorization differs from user expectations, sensitivity studies or "what-if" analyses could be conducted to shed further light on the potential variations in performance resulting from a range of building categorizations, or a more detailed engineering review could be implemented to fine-tune the categorization. Further, a similar analytical approach can be used to assess the potential improvement in performance associated with various conceptual mitigation strategies.

The district should take action on these facilities as soon as possible.

N. RSCCD Funded Short Term Development Trends

1998 California Seismic Survey Report
In 1998, California completed a seismic survey of all existing community colleges. Six buildings at Santa Ana Community College were recommended for seismic upgrades. To date, five of those have been completed and the sixth is scheduled for demolition in 2016.

2002 Measure E – Recently Completed Projects
In 2002, voters approved Measure E, a $337 million general obligation bond to renovate existing campus buildings and construct new classrooms to alleviate over-crowding and expand the educational and training programs at Santa Ana College, Santiago Canyon College, the regional education centers and the district operations center of the Rancho Santiago Community College District (RSCCD).

To date, every priority project earmarked for funding under Measure E has been or will be completed on schedule, according to the facility master plan for each college.

The Rancho Santiago Community College District issued $337,000,000 in bonds from Measure E which was passed in 2002.

Measure E Projects
In developing the Project list Santa Ana College and Santiago Canyon College faculty, staff and students have prioritized key health and safety needs so the most critical needs are addressed. The Project list was developed with the input of several hundred faculty, community and business leaders who determined that if these needs were not addressed now, the problems would only get worse. They advised the Board of Trustees that it would be less expensive to upgrade and repair aging community college buildings and classrooms now, than in the future. The Board of Trustees of the Rancho Santiago Community College District has evaluated safety, class size reduction, and information technology needs in developing the scope of repair and building projects to be funded, as outlined in the District's Master Plan, as amended from time to time, on file at the Public Information Office of the District, including the following projects:

1. *SAC Repair and renovate deteriorating classrooms and labs in fourteen (14) aging buildings (C, D, G, H, J, K, M, N, P, R, S, T, U, W).
$17,500,000

2. SAC Repair and renovate the library, its classrooms, labs and support areas and wire for computers and technology.
$1,700,000

3. SAC
Repair and renovate aging and deteriorating data and electric wiring, plumbing, sewer and storm drain systems, improve accessibility, fix safety hazards including earthquake dangers and otherwise bring aging structures into code compliance.
$15,000,000

4. SAC
To insure student safety and prepare to construct campus classrooms, labs and buildings, provide for site grading, electrical wiring,
Vehicular /pedestrian access, lighting, landscape development and water, sewer, and storm drain systems.
$25,000,000

5. SAC Repair, renovate and rewire for technology and computers of classrooms and learning spaces in the Workforce and Career Development Center.
$400,000

6. SCC Repair and renovate classrooms and labs in Buildings "A", "B" and "D".
$4,000,000

7. SAC/OFF-SITE Repair and renovate classrooms, for science, math, English labs and other academic and vocational programs at continuing education centers.
$2,500,000

8. SAC
Repair, renovate and expand outdoor field space for physical education, physical therapy, orthopedic exercise and rehabilitation, exercise physiology and exercise learning facilities
$850,000

9. DISTRICT-WIDE
Replace aging telephone/computer network including software and hardware to enable students to register, receive assignments /grades, and communicate with faculty on-line and to improve overall academic management.
$11,000,000

10. SAC/OFF-SITE Build/acquire/equip classrooms, science, math and English labs in Garden Grove Center.
$13,000,000

11. SCC To enhance student safety, acquire land to expand the campus academic and extracurricular programs, and support services.
$18,000,000

12. SCC/OFF-SITE Build/acquire/equip classrooms and English, math, science, and computer labs for a continuing education center.
$11,000,000

13 SAC To enhance student safety, acquire land and construct facilities to expand the campus academic, extracurricular programs, and support services.
$8,000,000

14. SCC Build and equip college library and learning resource center including study areas, seminar rooms, classrooms, and academic computer areas.
$10,000,000

15. SAC Build classrooms, labs, and provide computer network and equipment for a math and science building.
$31,000,000

16. SAC Build and equip classrooms and labs for teacher training/child development building.
$4,500,000

17. SAC Build and equip women's restrooms and changing facilities. $4,000,000

18. SAC Build and equip classrooms and labs for digital technologies including computer graphics, arts, video/sound design, animation and related academic, vocational and learning support programs.
$14,000,000

19. SAC/OFF-SITE Build and equip classrooms and labs and academic support facilities for public safety training programs.
$15,500,000

20. SAC/OFF-SITE Build and equip classrooms, labs for technology-based business incubator.
$13,000,000

21. SCC Build and equip study areas, counseling rooms, computer hook-ups, lecture/meeting/seminar rooms, and support facilities for providing student and faculty access to grades, course listings, and class assignments in new classrooms/services center.
$6,500,000

22. SCC Build and equip classrooms and labs for arts and humanities building.
$25,000,000

23. SCC Build and equip study areas, computer network, lecture/meeting/seminar rooms, and support facilities for student academic and community service programs and projects.
$18,000,000

24. SCC Build and equip classrooms, seminar rooms, and labs for arts and communication instruction.
$12,000,000

25. SCC Build and equip classrooms and learning facilities for use and instruction in exercise, exercise physiology, physical therapy, orthopedic exercise, rehab and other related disciplines.
$9,000,000

26. SCC Build and equip classrooms, labs, computer hook-ups and learning support facilities for math and science center.
$30,000,000

27. SCC Improve traffic safety, relieve traffic congestion on campus and alleviate campus and neighborhood parking issues and safety concerns, improve access for fire and emergency vehicles.
$1,200,000

28. SAC Improve traffic safety, relieve traffic congestion on campus and alleviate campus and neighborhood parking issues and safety concerns, improve access for fire and emergency vehicles.
$ 15,350,000

Measure Q – Future Projects
Measure Q was approved by the electorate of the Santa Ana College Facilities Improvement District No. 1 of the Rancho Santiago Community College District on November 6, 2012. This measure authorizes Rancho Santiago Community College District (RSCCD) to issue up to $198 million in general obligation bonds to finance renovation, repair and construction at Santa Ana College.

Capital Improvement Projects

- Central Plant & Infrastructure
- Dunlap Hall Renovation
- Health Sciences Building
- Johnson Student Center
- STEM Building
- 17th & Bristol Parking Lot

O. RSCCD Long Term Development Trends

Table 24: Facilities Recommended for Engineering Evaluation (2016 RSCCD Update)

This table was updated by Darryl Taylor, RSCCD Director of District Construction on February 2016. The table represents the RSCCD future hazard mitigation priority facilities.

High Priority **Moderate Priority** **Planned for future demolition**

Building Site/ Building Name	Occupancy	Non-Zero Injury Rate 3 Eq Scenarios	Non-Zero Fatality Rates 3 Eq Scenarios	Moderate Bldg. Codes/ Year Built
District Office - Admin Building/District EOC	399	YES		YES 1970
SAC – Bldg 01 Administration Building	231	YES		YES 1972 Upgraded 2009
SAC – Bldg 02 Cesar Chavez Building	1,236	YES	YES	NO
SAC – Bldg 03 Fine Arts Building	414	YES		YES 1972
SAC – Bldg 04 Music Building	179	YES		YES 1970
SAC – Bldg 05 Theater Building	575	YES		YES 1955
SAC – Bldg 06 Dunlap Hall Building ($15 million upgrade & additions complete) *REMOVE FROM HIGH PRIORITY LIST/Darryl Taylor*	1,636	YES	YES	YES 1973
SAC – Bldg 07 Planetarium Building	127	YES		YES 1967 Renovation 2015
SAC – Bldg 08 Library Building Facilities Master Plan - To be demolished in the future - *REMOVE FROM HIGH PRIORITY LIST/D. Taylor*	958	YES	YES	YES 1956
SAC – Bldg 09 Russell Hall Building Facilities Master Plan - *Remove from high priority list/D .Taylor*	1,293	YES	YES	YES 1967 Significant Structural Upgrade 2014
SAC – Bldg 10 Hammond Hall Building Facilities Master Plan -*Remove from high prioritiy list/D .Taylor*	452	YES	YES	YES 1954
SAC – Bldg 11 Technical Arts Building	254	YES		YES 1970
SAC – Bldg 12 Exercise Science	227	YES		YES 1972 Retrofitted
SAC – Bldg 13 Gymnasium Building (*Some upgrades in 2010. No future plans at this time)/D. Taylor*	2,535	YES	YES	YES 1954
SAC – Bldg 14 Locker Building	136	YES		NO 2009 Rebuilt
SAC – Bldg 15 Fitness Center	84	YES		YES 1972

SAC – Bldg 16 Johnson Center Building/ U Building Johnson	727	YES	YES	Scheduled for demolition in 2016
SAC – Bldg 18 Auto Shop Building	159	YES		YES 1958 Retrofitted
SAC – Bldg 19 Maintenance & Publication	159	YES		YES 1950
SAC – Bldg 20 Campus Vehicles Bldg	10			YES 1950
SAC – Bldg 21 Welding/Maintenance	112	YES		YES 1958
SAC – Bldg 23 Classroom Building I	725	YES	YES	NO
SAC – Bldg 25 Maintenance & Storage	10			YES 1950
SAC – Bldg 26 Mechanical Pool Building	1			YES 1947
SAC – Bldg 28 Office/Storage	10			YES 1947
SAC – Bldg 32 Pool Equipment	1			YES 1947
SAC – Bldg 31 Middle School Bldg	480	YES		NO
SAC –Bldg 100 Child Development	126	YES		NO
SAC – Bldg 300 Child Development	96	YES		NO
SAC – Bldg 400 Child Development	96	YES		NO
CEC - Admin/Classroom Building A Wing	265	YES		NO
CEC - Classroom Building B Wing	200	YES		NO
CEC - Child Development Building C Win	223	YES		NO
CEC - Art Building D Wing	316	YES		NO
CEC - TV Studio/Classroom Building E W	189	YES		NO
CEC - Classroom Building F Wing	261	YES		NO
CEC – Portable Classroom	92	YES		NO
Digital Media Center	283	YES		NO
Orange Education Center	1,600	YES	YES	NO
SCC – Classroom Building B	529	YES		NO
SCC – Lecture Hall/Classroom Building	999	YES		NO
SCC – Admin/Office/Classroom Building	675	YES		NO
SCC - Library	661	YES		NO
SCC – Science Center	918	YES		NO
SCC - Physical Education Building	2,438	YES		NO
SCC – Humanities Building	1,560	YES		NO
OCSRT - Sheriff Administration/Training Academy	304	YES		NO

High Priority/Highlighted in Yellow

- Yes to non-zero injury, Yes to non-zero fatality, and Yes to moderate building codes

Moderate Priority/Highlighted in Green

- Yes to non-zero injury, Yes to non-zero fatality and No to Moderate Code as well as any with Yes and Moderate Code

Planned for future Demolition in the RSCCD Facilities Master Plan

P. RSCCD Earthquake Mitigation Strategies

Hazard	**Earthquake Activity #1**
Action Item	**Identify and mitigate potentially vulnerable non-structural components and systems**
Coordinating Organization	Facilities Manager
Ideas for Implementation	▪ Determine if a Facilities Safety Committee needs to be formed. It could include RSCCD Facilities, City Building Officials and a representative from the Department of State Architect (EQ-2) ▪ Work with contractors to provide cost estimates for this project. ▪ Write a FEMA Hazard Mitigation project grant to develop a complete Non-Structural Hazard Mitigation Program for the RSCCD ▪ As part of the grant, research what steps have already been taken by the district; determine steps still needed to prepare all sites for their sites worst case scenario and prepare a Non-Structural Hazard Mitigation Plan ▪ Implement the Non-Structural Hazard Mitigation Plan ▪ Develop a long-term maintenance plan for the program
Time Line	3 years and ongoing
Constraints	Grant approval by Cal EMA and FEMA
Funding Sources	25% General Fund and 75% FEMA Maintenance costs are 100% RSCCD
Cost Estimate	$21 million
Benefits: Losses Avoided	Life Safety and reduced injuries; reduced property damage from earthquakes; in older and critical facilities such as the campus EOCs, it will allow for continued emergency management operations during a disaster
Priority	**Extremely High**

Plan Goals Addressed

	Promote Public Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	EARTHQUAKE ACTIVITY #2
Action Item	Phase 1: (Phase 2 is a long term strategy) **Conduct a structural engineering evaluation of RSCCD facilities to determine if they meet today's building codes and if structural retrofits are needed in older facilities. Note: See attached list of facilities.**
Coordinating Organization	Director District Construction
Ideas for Implementation	▪ Determine if a structural evaluation has ever been conducted and on which buildings ▪ Review Bond measures to see what facility replacements/upgrades are planned for the future ▪ Research and document what has been accomplished and what still needs to be done ▪ Decide if a formal assessment of facilities is needed. If so, determine how facilities will be prioritized (by year, by site, etc.). See Table 25 for a start on a priorities list. This is not a final list; it is a starting point for discussion. ▪ Get a cost estimate from a contractor ▪ Prepare a priority list, plans and timelines ▪ Develop an RFP Note: This is Phase 1 and Phase 2 is Long Term Activity #1
Time Line	10 years
Constraints	Time (shortage of facility personnel); Costs
Funding Sources	California Community College State Capital Outlay Fund FEMA Hazard Mitigation Grant
Cost Estimate	$5 – 7 million
Benefits: Losses Avoided	Life Safety; Reduced property damage due to earthquakes; Continuity of operations critical facilities; Creates partnerships
Priority	Extremely High

Plan Goals Addressed	
	Promote Public Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Note: There is no requirement on RSCCD by State DSA to repair these facilities due to lacking construction. These are voluntary upgrades.

TABLE 25: FACILITIES RECOMMENDED FOR ENGINEERING EVALUATION (MMI DATA)

High Priority — Moderate Priority

Building Site/ Building Name	Occupancy	Non-Zero Injury Rate 3 Eq Scenarios	Non-Zero Fatality Rates 3 Eq Scenarios	Moderate Bldg. Codes/ Year Built
District Office - Admin Building/District EOC	399	YES		YES 1970
SAC – Bldg 01 Administration Building	231	YES		YES 1972
SAC – Bldg 02 Cesar Chavez Building	1,236	YES	YES	NO
SAC – Bldg 03 Fine Arts Building	414	YES		YES 1972
SAC – Bldg 04 Music Building	179	YES		YES 1970
SAC – Bldg 05 Theater Building	575	YES		YES 1955
SAC – Bldg 06 Dunlap Hall Building	1,636	YES	YES	YES 1973
SAC – Bldg 07 Planetarium Building	127	YES		YES 1967
SAC – Bldg 08 Library Building	958	YES	YES	YES 1956
SAC – Bldg 09 Russell Hall Building	1,293	YES	YES	YES 1967
SAC – Bldg 10 Hammond Hall Building	452	YES	YES	YES 1954
SAC – Bldg 11 Technical Arts Building	254	YES		YES 1970
SAC – Bldg 12 Exercise Science	227	YES		YES 1972 Retrofitted
SAC – Bldg 13 Gymnasium Building	2,535	YES	YES	YES 1954
SAC – Bldg 14 Locker Building	136	YES		NO 2009 Rebuilt
SAC – Bldg 15 Fitness Center	84	YES		YES 1972
SAC – Bldg 16 Johnson Center Building	727	YES	YES	NO/Scheduled for demolition in 2016
SAC – Bldg 18 Auto Shop Building	159	YES		YES 1958 Retrofitted
SAC – Bldg 19 Maintenance & Publication	159	YES		YES 1950
SAC – Bldg 20 Campus Vehicles Bldg	10			YES 1950
SAC – Bldg 21 Welding/Maintenance	112	YES		YES 1958
SAC – Bldg 23 Classroom Building I	725	YES	YES	NO
SAC – Bldg 25 Maintenance & Storage	10			YES 1950
SAC – Bldg 26 Mechanical Pool Building	1			YES 1947
SAC – Bldg 28 Office/Storage	10			YES 1947
SAC – Bldg 32 Pool Equipment	1			YES 1947
SAC – Bldg 31 Middle School Bldg	480	YES		NO
SAC –Bldg 100 Child Development	126	YES		NO
SAC – Bldg 300 Child Development	96	YES		NO
SAC – Bldg 400 Child Development	96	YES		NO
CEC - Admin/Classroom Building A Wing	265	YES		NO
CEC - Classroom Building B Wing	200	YES		NO
CEC - Child Development Building C Win	223	YES		NO
CEC - Art Building D Wing	316	YES		NO
CEC - TV Studio/Classroom Building E W	189	YES		NO

CEC - Classroom Building F Wing	261	YES		NO
CEC – Portable Classroom	92	YES		NO
Digital Media Center	283	YES		NO
Orange Education Center	1,600	YES	YES	NO
SCC – Classroom Building B	529	YES		NO
SCC – Lecture Hall/Classroom Building	999	YES		NO
SCC – Admin/Office/Classroom Building	675	YES		NO
SCC - Library	661	YES		NO
SCC – Science Center	918	YES		NO
SCC - Physical Education Building	2,438	YES		NO
SCC – Humanities Building	1,560	YES		NO
OCSRT - Sheriff Administration/Training Academy	304	YES		NO

High Priority/Highlighted in Yellow

- Yes to non-zero injury, Yes to non-zero fatality, and Yes to moderate building codes

Moderate Priority/Highlighted in Orange

- Yes to non-zero injury, Yes to non-zero fatality and No to Moderate Code as well as any with Yes and Moderate Code

Moderate Code Buildings – Buildings built prior to 1976 (reflect post-San Fernando earthquake changes in the Uniform Building code)

Scenarios Include:

- 6.9M Newport-Inglewood Fault
- 6.6M San Joaquin Hills Fault
- 6.8M Whittier Fault

NOTE:
So there is no confusion, Table 24 (below) is the updated version of Table 25 (above). Table 24 (below) is also the same table listed in "Future Development Trends." After considerable research of the Facilities Master Plan, Bond Measures, and all facility planning documents by the Director of District Construction, this table summarizes the RSCCD earthquake hazard mitigation goals for the future. Many *of these projects are already funded while others are not funded.*

FIGURE 24: FACILITIES RECOMMENDED FOR ENGINEERING EVALUATION (2016 RSCCD UPDATE)

This table was updated by Darryl Taylor, RSCCD Director of District Construction on February 2016. The table represents the RSCCD future hazard mitigation priority facilities.

High Priority **Moderate Priority** **Planned for future demolition**

Building Site/ Building Name	Occupancy	Non-Zero Injury Rate 3 Eq Scenarios	Non-Zero Fatality Rates 3 Eq Scenarios	Moderate Bldg. Codes/ Year Built
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SAC – Bldg 06 Dunlap Hall Building ($15 million upgrade & additions complete) *REMOVE FROM HIGH PRIORITY LIST/Darryl Taylor*	1,636	YES	YES	YES 1973
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SAC – Bldg 10 Hammond Hall Building Facilities Master Plan -*Remove from high prioritiy list/D .Taylor*	452	YES	YES	YES 1954
SAC – Bldg 11 Technical Arts Building	254	YES		YES 1970
SAC – Bldg 12 Exercise Science	227	YES		YES 1972 Retrofitted
SAC – Bldg 13 Gymnasium Building (*Some upgrades in 2010. No future plans at this time)/D. Taylor*	2,535	YES	YES	YES 1954
SAC – Bldg 14 Locker Building	136	YES		NO 2009 Rebuilt
SAC – Bldg 15 Fitness Center	84	YES		YES 1972
SAC – Bldg 16 Johnson Center Building/ U Building Johnson	727	YES	YES	Scheduled for demolition in 2016
SAC – Bldg 18 Auto Shop Building	159	YES		YES 1958

				Retrofitted
SAC – Bldg 19 Maintenance & Publication	159	YES		YES 1950
SAC – Bldg 20 Campus Vehicles Bldg	10			YES 1950
SAC – Bldg 21 Welding/Maintenance	112	YES		YES 1958
SAC – Bldg 23 Classroom Building I	725	YES	YES	NO
SAC – Bldg 25 Maintenance & Storage	10			YES 1950
SAC – Bldg 26 Mechanical Pool Building	1			YES 1947
SAC – Bldg 28 Office/Storage	10			YES 1947
SAC – Bldg 32 Pool Equipment	1			YES 1947
SAC – Bldg 31 Middle School Bldg	480	YES		NO
SAC –Bldg 100 Child Development	126	YES		NO
SAC – Bldg 300 Child Development	96	YES		NO
SAC – Bldg 400 Child Development	96	YES		NO
CEC - Admin/Classroom Building A Wing	265	YES		NO
CEC - Classroom Building B Wing	200	YES		NO
CEC - Child Development Building C Win	223	YES		NO
CEC - Art Building D Wing	316	YES		NO
CEC - TV Studio/Classroom Building E W	189	YES		NO
CEC - Classroom Building F Wing	261	YES		NO
CEC – Portable Classroom	92	YES		NO
Digital Media Center	283	YES		NO
Orange Education Center	1,600	YES	YES	NO
SCC – Classroom Building B	529	YES		NO
SCC – Lecture Hall/Classroom Building	999	YES		NO
SCC – Admin/Office/Classroom Building	675	YES		NO
SCC - Library	661	YES		NO
SCC – Science Center	918	YES		NO
SCC - Physical Education Building	2,438	YES		NO
SCC – Humanities Building	1,560	YES		NO
OCSRT - Sheriff Administration/Training Academy	304	YES		NO

High Priority/Highlighted in Yellow

- Yes to non-zero injury, Yes to non-zero fatality, and Yes to moderate building codes

Moderate Priority/Highlighted in Green

- Yes to non-zero injury, Yes to non-zero fatality and No to Moderate Code as well as any with Yes and Moderate Code

Planned for future Demolition in the RSCCD Facilities Master Plan

Hazard	EARTHQUAKE ACTIVITY #3
Action Item	**Increase Earthquake Risk Awareness (EQ-7)**
Coordinating Organization	Chief District Safety & Security
Ideas for Implementation	▪ As part of the planning process for this plan, present the RSCCD Hazard Mitigation Plan to as many RSCCD staff, faculty, students and the public as possible ▪ Every occasion the Risk Manager or Chief, Security and Safety presents the districts emergency preparedness program, include information on the RSCCD Hazard Mitigation Plan and ask for input into future projects. ▪ Utilize the maps in the plan for employee and public education ▪ Include an overview of the plan, its goals, maps and lists of "moderate code" buildings when training Building Captains. Discuss which buildings are more vulnerable to earthquake and should not be used following an earthquake
Time Line	Ongoing
Constraints	Chief District Safety & Security can only offer the training; attendance is voluntary
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Sustained mitigation outreach programs have minimal cost and will help build and support district-wide capacity. This type of activity enables the district faculty, students and the public to better prepare for, respond to and recover from disasters.
Priority	High

Plan Goals Addressed	
X	Promote Public and College Community Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	EARTHQUAKE ACTIVITY #4
Action Item	**Prepare to conduct post-earthquake inspections (EQ-4)**
Coordinating Organization	Chief, District Safety & Security
Ideas for Implementation	▪ Train building facilities and maintenance personnel on how to conduct building inspections following disasters using Cal EMA Safety Assessment Program and update the training every other year ▪ Establish a campus survey procedure manual to inventory structural and non-structural hazards in and around campus'. Include lists of critical facilities that should be inspection priorities. Include lists of "moderate code" facilities that may have more damage than other buildings. ▪ Develop Inspection Kits that include ATC 20 forms, placards (SAFE, UNSAFE, LIMITED ACCESS, etc.), manual, publications, and tools needed to inspect, document and communicate ▪ Conduct an annual tabletop exercise practicing: (1) Reporting to work and District EOC procedures (2) Assigning and tracking Facilities and Maintenance personnel for inspections; (3) Documentation required by FEMA (4) Use of ATC 20 forms to provide rapid visual screenings to quickly inspect a building and identify disaster damage or potential seismic structural and non-structural weaknesses to determine if buildings are safe to re-occupy (5) Mutual Aid requirements to get additional inspectors from the City, Operational Area, Cal EMA, Department of State Architect, FEMA and their reporting and documentation requirements ▪ Develop a program using SHAKECAST, a HAZUS software to prepare the district to conduct post-earthquake inspections. Hire personnel to enter data into the program. ▪ Print and become familiar with publications such as American Society of Civil Engineers (ASCE) 31 – Seismic Evaluation of Existing Buildings, ASCE 41 – Seismic Rehabilitation of Existing Buildings and Applied Technology Council ATC) 20 – Procedures for Post-earthquake Safety Evaluation of Buildings
Time Line	3 years and ongoing
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	By educating the existing employees on how to conduct an initial damage assessment following a disaster, the campus' can inspect and quickly post facilities "safe" or "unsafe" keeping students, faculty and the public out of dangerous buildings and areas. If damage exists, the employees will be using these State of California approved forms and process which will facilitate the district's disaster assistance process. Low cost item.
Priority	High

Plan Goals Addressed	
	Promote Public Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard:	EARTHQUAKE ACTIVITY #5
Action Item	Phase 2: (Phase 1 is a Evaluation Phase that determines which facilities need strengthened and determines costs of projects) **Seismically strengthen RSCCD facilities that do not meet current seismic codes. Ensure critical facilities are a priority.**
Coordinating Organization	Asst. Vice Chancellor of Facilities Planning
Ideas for Implementation	▪ Prioritize facilities ▪ Seismically retrofit high occupancy and critical facilities ▪ Seismically retrofit all other RSCCD facilities
Time Line	10 years
Constraints	Time, Expertise and Budget
Funding Sources	General Fund, California Community College State Capital Outlay Fund or California Community College Scheduled Maintenance Program, and FEMA Hazard Mitigation Grant
Cost Estimate	Receiving the cost estimates is part of the Phase 1 of this project
Benefits: Losses Avoided	This project is essential to life safety, property protection and reducing recovery costs. Earthquake and liquefaction are major threats to the district and reducing damage to structures is critical to the faculty, students, and public's survival.
Priority	**Extremely High**

Plan Goals Addressed	
	Promote Public Awareness
	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services