State Of California

ALFRED E. ALQUIST
SEISMIC SAFETY COMMISSION

Governor Edmund G. Brown Jr.

Hearing – Impacts and Lessons Learned from the South Napa Earthquake
Napa Double Tree Hilton
3600 Broadway Street, American Canyon, California
October 8, 2014

Members Present

Timothy Strack, Chairman
Tracy Johnson, Vice Chair
Salud Carbajal
Ken Cooley
Michael Gardner
Randall Goodwin
Mark Johnson (for Mark Ghilarducci)
Peggy Hellweg
Helen Knudson
Emir Macari
Jim McGowan
Kit Miyamoto
Ian Parkinson
David Rabbit
Fuad Sweiss
Mark Wheetley
Chester Widom

Commissioners Absent

Greg Beroza
Ellen Corbett

Staff Present

Richard McCarthy, Executive Director
Karen Cogan, Administrative Officer
Robert Anderson, Sr. Engineering Geologist
Henry Reyes, Special Projects Manager
Fred Turner, Structural Engineer

I. CALL TO ORDER

Chairman Timothy Strack called the hearing of the Alfred E. Alquist Seismic Safety Commission to order at 1:00 p.m. and welcomed all participants.

II. CHAIRMAN'S REMARKS

Chairman Strack said the Commission was interested in hearing about impacts and lessons learned from the recent South Napa Earthquake. He noted the best public policy comes from the public, so the Commission wants to gather as much information as possible about local issues.

Chairman Strack welcomed the representatives from the Pacific Earthquake Engineering Research Center (PEER) and the Jet Propulsion Laboratory (JPL), and he asked them to introduce themselves. Dr. Susan Owen, principal investigator; Mr. Frank Webb, deputy manager, Earth Science and Research Program Formulation Office; Mr. Ronald Lama, Program

Manager for Earth Science and Natural Hazards, all from JPL; and Mr. Steve Mahin, Director, PEER Center at UC Berkeley, introduced themselves.

Chairman Strack said the Commission is involved in a number of projects with JPL and PEER pertaining to scientific methods of analyzing earthquakes, and the goal is to help California become safer and more resilient.

Chairman Strack noted that the Commission staff would be taking notes during the hearing, and the Commission will issue a set of recommendations in several months.

Roll Call

Administrative Officer Karen Cogan called the roll and confirmed the presence of a quorum.

III. EMERGENCY RESPONSE/RECOVERY/LESSONS LEARNED FROM THE SOUTH NAPA EARTHQUAKE

Chairman Strack thanked Mayor Leon Garcia, City of American Canyon, for hosting the Commission meeting, and he invited Mayor Garcia to address the Commission.

Mayor Garcia welcomed the Commission to American Canyon. He pointed out that the Napa Double Tree Hilton was the first gold LEED-certified hotel in northern California. He noted that American Canyon is a small community of about 20,000 people, and the city was the epicenter of the South Napa earthquake and experienced considerable shaking on August 24, 2014.

Mayor Garcia stated that nearly every house in American Canyon had some earthquake damage, but fortunately, most buildings are newer and were built to certain earthquake standards. He observed that although building to higher standards can cost more, the investment is well worth the resulting good performance in an earthquake. Mayor Garcia stated that 55 homes in American Canyon received yellow tags, mostly due to severe chimney damage to unreinforced masonry chimneys in an older section of town, as well as some water heater damage. He reported that in the months following the earthquake, the staff inspected 475 homes, nearly 10 percent of the city's entire stock of single-family homes. He added that city inspectors took advantage of the opportunity to educate residents about proper water heating bracing.

Mayor Garcia noted that several local businesses had damage from broken water sprinkler pipes, displaced walls, and damaged storage tank footings. He reported that he contacted all the businesses in the main part of town on August 24 and found that water sprinkler damage was the biggest issue, especially for the local Walgreens pharmacy and a local gym. He recommended upgrading code requirements for how fire sprinklers are anchored. Mayor Garcia noted that some businesses were closed for a few weeks while water damage was being repaired.

Mayor Garcia said the city offered free building permits and inspections for residents making earthquake repairs to their homes. He noted the city council amended the community development block grant funds to provide grants to lower-income residents to repair earthquake-damaged chimneys and retrofit mobile homes with earthquake foundation strapping, and block

grant funds were also made available for deferred low-interest loans to low-income residents for earthquake repairs.

Mayor Garcia remarked that American Canyon's primary response to the earthquake was to help its neighbors. He reported that the city sent firefighter and public works teams to Napa to help with their emergencies. He noted that five mobile homes burned in Napa, and downtown water mains suffered considerable damage. Mayor Garcia said he was pleased to report that no one was transported to a hospital by ambulance, and nobody was red-tagged out of a home.

Mayor Garcia said the fire chief and public works director were very satisfied with American Canyon's performance during the earthquake. He noted the city did not open its own emergency operations center because there was a greater need to send staff to other communities to assist them. He recommended working on alternate communications systems with staff so they can be contacted in the field.

Chairman Strack asked when the decision was made not to open the emergency operations center (EOC). Mayor Garcia said the fire chief did inspections early on, assessed the damage, and concluded that the EOC was not needed.

Commissioner Ken Cooley asked what percentage of the city's housing stock was mobile homes. Mayor Garcia responded that he did not know the exact number, but the percentage was very small. Commissioner Cooley asked if there were any issues with special populations, such as elderly or mobility-impaired people. Mayor Garcia said seniors tend to make up a significant portion of the population of mobile home parks. He noted the Family Resource Center was active in assisting and reaching out to local seniors. He stated that some mobile homes experienced some wracking of foundations, but nothing that resulted in red-tagging, and there are funds available to realign the mobile homes on solid foundations.

Commissioner Salud Carbajal observed that communication is an issue that always comes up after disasters, and he asked Mayor Garcia to assess the city's ability to communicate internally and with the county and other municipalities. Mayor Garcia said others may have more details, but he knew that the general feedback was that systems seemed to work effectively. He noted there was a good mutual aid response with neighboring cities, and the city sent its own public works and firefighting crews to other places to help. He stated that he was not aware of any major issues or concerns.

Commissioner Fuad Sweiss asked Mayor Garcia to elaborate on the deferred low-interest-rate loans for low-income residents. Mayor Garcia responded that the city has a housing program, and because chimney repairs and water heater replacement were not identified specifically in the community block grants, the city council held a special meeting to amend the ordinance to include those repairs. He added that there are income eligibility requirements.

Commissioner David Rabbitt asked if the city has a written earthquake response plan in the EOC. Mayor Garcia said he assumed there was a plan, because the staff responded accordingly. He noted that the fire chief would be better able to address that issue.

Chairman Strack thanked Mayor Garcia for his remarks.

Chairman Strack welcomed Mayor Jill Techel, City of Napa, and Napa County Board of Supervisors Chair Mark Luce. Mayor Techel introduced City Manager Mike Parness and Fire Chief Mike Randolph.

Mayor Techel said she was excited to hear more from the experts about what the area can learn from this earthquake and what to expect in the future. She noted that most people in Napa experienced the event as a big jolt at 3:20 a.m. She stated that the earthquake measured 6.0 magnitude and was centered five miles south-southwest of the City of Napa on the West Napa Fault. Mayor Techel indicated there are underlying fractures that have become more apparent since the earthquake occurred.

Mayor Techel showed photos depicting damage to roadways, water lines, and buildings as a result of the earthquake. She said guests at downtown hotels were displaced and evacuated due to damage and water issues. She stated that there were three structure fires caused by broken gas lines, and six homes were destroyed because of broken water lines and lack of pressure to put out fires.

Mayor Techel reported that a City of Napa EOC and a Napa County EOC were opened immediately. She said there were some noticeable aftershocks, and people began noticing more damage during daylight hours. She noted the hardest hit area was Browns Valley and the west side of town, but older buildings in the old part of downtown were also badly hit.

Mayor Techel indicated there were 177 water system breaks countywide, although the main transmission line and both treatment plans were undamaged. She said it took five to six days to fix the breaks in the water system, and up to 600 customers were without water service for an extended period of time. She showed photos of damage to a water tank in Browns Valley and said lowering the water to a safer level resulted in very low water pressure, impairing people's ability to cook and bathe during daytime hours.

Mayor Techel advised that PG&E made a tremendous effort to restore electrical service and inspect homes so gas could be turned back on.

Mayor Techel said there were 283 injuries reported countywide, 234 patients were treated at Queen of the Valley Hospital, of which eight were admitted, four in critical condition, and one fatality. She noted there were two waves of injuries, one immediately after the earthquake, and another surge during the clean-up phase.

Mayor Techel reported that 153 buildings were red-tagged, and more than 1,100 were yellow-tagged. She showed photos of damage to downtown historic post office, the Silver buildings, and an affordable housing complex.

Supervisor Luce played a short video showing areas within the Napa County jail at the time of the earthquake. He remarked that the people of Napa are fortunate because if the earthquake had happened at any other time of day, it would have been a far worse disaster. He talked about his

experience with neighbors knocking on doors and checking on each other. Supervisor Luce reported that he received a call a short time after the earthquake informing him that the emergency operations center (EOC) would be opening in a location other than downtown. He said he drove through downtown Napa and realized the extent of the damage. He added that he was struck by the number of fire engines that responded, and he expressed his appreciation for the assistance other areas provided through the mutual aid system.

Supervisor Luce reported that Napa opened an EOC at the sheriff's facility south of town, and there was great response from federal and state agencies. He noted that CalOES sent inspectors immediately to help assess damage, and FEMA representatives also provided advice and direction about how to proceed.

Supervisor Luce said recovery began immediately. He observe that the City of Napa has an excellent emergency response plan that includes disposal sites throughout the city to help residents clean up debris and waste and expedite recovery. He said county and city agencies worked with Red Cross and others to open a shelter and provide needed services.

Supervisor Luce noted that the next step was visiting and inspecting buildings to determine the extent of damage, because FEMA and OES need this information to decide the magnitude of the disaster and what assistance will be provided. Supervisor Luce reported that the damage assessment showed $362 million in damage a this point. He added that not all building owners have reported, so that figure could grow.

Supervisor Luce showed pictures of damage to Napa's historic courthouse, estimated now at $15 million to $30 million. He said officials have not decided whether to renovate or replace the building.

Supervisor Luce noted that one of the county's most important jobs after the earthquake was to asses what was safe and functional, and also what structures needed to be red-tagged and yellow-tagged. He said county officials contacted local wineries and asked them to report damages. He stated that about $80 billion has been reported so far, but there are some warehouse facilities that have not yet been inspected.

Supervisor Luce advised that all key county facilities were hit hard by the earthquake, including the administration building, the jail, the county courthouse, and buildings on the Health and Human Services campus. He reported that about a third of the county's employees were dislocated. Supervisor Luce noted that Napa County was in the process of acquiring a large new campus from Day Lab, and that facility was used for temporary office space so the county could continue providing services.

Supervisor Luce showed slides depicting damage to the county's administration building. He said there was extensive water damage, primarily from broken lines to rooftop chillers, and that later led to widespread growth of mold. He noted that repairs will probably take several months. He displayed photos of damage to the county's library and a Health and Human Services building.

Supervisor Luce observed that the county's Public Works Director was busy assessing roads, relocating employees, assessing damage to county buildings, and figuring out solutions. He presented slides showing road work and ruptures on the slab floors of the high school building.

Supervisor Luce reported that Napa County and the City of Napa set up a local assistance center to provide a one-stop place for residents to come for assistance. He said besides local agencies, federal and state representatives, as well as insurance companies, were on hand to provide immediate help.

Mayor Techel summarized what worked well in the City's response to the disaster. She said the City was pleased with how neighbors helped neighbors and businesses helped businesses. She noted the availability of iPhones seemed to help keep people calm, because they had access to immediate information about the earthquake, and the phones also provided a source of light.

Mayor Techel said citizens started clean-up immediately, and sites were established for people to dispose of debris. She estimated that about $20 million had been spent so far on disposing of debris. She noted that private property owners of downtown buildings were on site quickly with engineers to help shore up their buildings so they could remain functional and safe. Mayor Techel stated that the City of Napa has been keeping a constant focus on resiliency, so most people were well prepared. She added that nearly all downtown businesses were back up and running within a week.

Mayor Techel said the City of Napa is using the earthquake to encourage better preparedness, and she showed an informational article in a local magazine. She noted the magazine also includes articles on everyday heroes that emerged during the earthquake, like the building supply store that provided extra plywood, or the coffee shop that gave coffee to the firefighters. She remarked that little efforts like these help a community move forward after a disaster.

Supervisor Luce emphasized the importance of continuous mobilization and disaster training. He noted that Napa has experience responding to flood disasters, but with staff turnover, ongoing training and exercises are critical in ensuring a smooth transition. He said the City of Napa took the lead in responding to media questions and disseminating information to the public, and the county provided assistance as needed. Supervisor Luce commended all of the regional response organizations for their coordination and help.

Mayor Techel said the Napa earthquake raised a number of questions that warrant further research. First, she asked why some newer structures and buildings failed. She said water pipe breaks could be expected in older buildings, but not in new downtown hotels. She noted there was also a wall separation in a 2006 mixed-use structure, a bolt failure on a year-old pedestrian bridge, and movement in a flood wall still under construction.

Second, Mayor Techel noted, citizens of Napa want to know if retrofitted older buildings performed as expected. She reported that most of the retrofitted buildings are still standing, but some had damage from falling bricks and blocks. She remarked that some people incorrectly assume there will be no damage in properly retrofitted buildings.

Supervisor Luce identified areas that could be improved. He said the county's jail was yellow-tagged, and finding replacement housing for 250 inmates would be very challenging. He recommended further attention to this issue. He also emphasized the need to provide continuity of government. He observed that Napa County was fortunate to have additional space available.

In terms of working with other agencies, Supervisor Luce noted, local jurisdictions need to conduct prompt damage assessments so they can estimate the value of the loss and receive government assistance. He advised that this was relatively easy to do with public facilities, but the private sector was more difficult. He noted that once a building is red-tagged, that kind of information does not become available until the owner hires a professional inspector, which could take some time. Supervisor Luce expressed his opinion that it might be more cost-effective to provide cost estimates at the same time buildings are initially assessed and tagged.

Supervisor Luce commented that FEMA is not providing the assistance they used to in responding to disasters. He recalled an earthquake about a decade earlier that produce about one quarter of the damage, and said FEMA provided individual assistance immediately. He noted that an official declaration of disaster is a critical step in accessing government funds for recovery. Supervisor Luce pointed out that earthquake damage is not always as easy to see as damage from other disasters, so estimating damages is trickier. He noted that the county has worked hard on behalf of its citizens to advocate for disaster recovery funding. He also mentioned that a local nonprofit organization had made a charitable donation to assist with post-disaster recovery.

Supervisor Luce recommended ongoing training in preparing for disasters and responding to disasters. He said Napa wanted to make sure visitors knew that businesses were still open. He noted that media relations went well, and there were regular releases on information on Facebook and other social media. Supervisor Luce commented that there was a great volunteer response initially, but it would be helpful to have a program in place to provide a labor force for ongoing clean-up and recovery.

Commissioner Helen Knudson asked if the alternate location for the EOC was planned as a back-up. Supervisor Luce responded that the secondary location was identified in the plan, and the county has operated from that site before. He acknowledged that there were some problems, noting that the boxes containing EOC supplies were still housed in the administration building.

Commissioner Kit Miyamoto thanked Mayor Techel and Supervisor Luce for their presentation, and he commended the City and County of Napa for their excellent response and recovery efforts, especially the way the agencies communicated with each other and citizens. He noted that Napa can serve as a case study illustrating aspects of emergency response and recovery that work well.

In response to Mayor Techel's question about the seismic performance of newer buildings, Commissioner Miyamoto clarified that life safety is the standard for the current building code, so the resiliency of components is not addressed. He said building to higher standards entails only a nominal increase in costs.

Supervisor Luce described one retrofitted building that was damaged, but noted that the steel structure remained and the building did not collapse.

Commissioner Miyamoto asked for more details about the damage to the county courthouse. Supervisor Luce explained that there actually three buildings in the complex, and each was built at a different time, so standards varied. He said the damaged section was the oldest portion, constructed in the 1800's. He noted that repair estimates are in the tens of millions if the historic nature of the structure is maintained, but there is a possibility that insurance may cover only some of those costs. Commissioner Miyamoto stated that in his experience, damage repairs are usually about 10 to 40 percent of the base building cost. He expressed his opinion that historic structures should be preserved if the repair cost is reasonable.

Commissioner Miyamoto recalled that Supervisor Luce had mentioned conducting post-earthquake damage assessments. Supervisor Luce clarified that those were safety assessments. He acknowledged that there are different sets of standards for post-disaster assessment and tagging of buildings. Commissioner Miyamoto noted that most California inspectors use ATC-20 for rapid safety assessments.

Commissioner Miyamoto encouraged public officials in Napa to take advantage of this opportunity to educate and inform the public about mitigation options. Supervisor Luce agreed that there was a short window of high visibility and public attention, but interest fades after that.

Chairman Strack reported that he was contacted by a Chinese journalist who questioned why there were not large numbers of deaths in this size of an earthquake in the middle of the night. He said this helps keep in perspective the advance planning and efforts jurisdictions like Napa have taken to prepare and respond to disasters.

Commissioner Mark Wheetley noted that the City of Arcata sent a building inspector to Napa to help after the earthquake, and that individual mentioned the debris disposal areas. He asked if those areas were coordinated through neighborhood emergency response teams. Commissioner Wheetley also asked whether nonprofit and community organizations responded on an ad-hoc basis or as part of a coordinated plan.

Mayor Techel noted that inspectors from other jurisdictions were helpful in completing field inspections quickly. She said the City of Napa learned that when a disaster is localized, more mutual aid is available, facilitating a more rapid recovery. She observed that if this earthquake had involved the whole Bay Area, Napa and other communities could not depend on getting that level of support as quickly so they need to plan to be self-sufficient.

Mayor Techel said the City of Napa first used school sites as refuge centers, but then programs were moved to more centralized locations. Supervisor Luce added that the emergency response plan identifies sites that can be used for these purposes in disasters.

Supervisor Luce acknowledged that Napa was lucky to have a vintner organization that regularly raises money for nonprofit organizations through a foundation. He said that organization made a substantial contribution to facilitate recovery, and others in the community made donations. He

indicated that the county is developing criteria and looking at ways of using those funds where they are most needed. He advised that there were hundreds of mobile homes that were knocked off their foundations, and it might be most cost-effective to hire a single contractor to repair them all at once.

City Manager Mike Parness talked about how the City of Napa worked with local nonprofit and community organizations. He said representatives from a number of groups arrived at the EOC shortly after the earthquake. He reported that the Salvation Army served 7,000 meals in the first five days, and the Red Cross opened a shelter. He advised that the city has about 1,200 mobile homes, and a state inspector concluded that 80 percent of those structures should be red-tagged. Mr. Parness noted that having food trucks at the sites and shelters already available was very helpful, and the city worked with others to get the buildings back up and running so residents could reoccupy them as quickly as possible.

Supervisor Luce observed that the earthquake broke some windows of a downtown store, spilling merchandise out into the street, and citizens responded by picking up the merchandise and placing it back in the store.

Commissioner Emir Macari agreed with Commissioner Miyamoto that Napa's response could serve as a valuable case study to identify how response efforts can go well.

Commissioner Macari expressed interest in hearing more about Napa's unreinforced masonry (URM) buildings and retrofitting requirements. He noted that the purpose of retrofitting is to reduce the loss of life and injury, and he recommended clarifying that point so people understand the limitations. He asked about Napa's compliance with the current URM law.

Mayor Techel said that after the 2000 earthquake, the City revised its URM law to provide incentives for retrofitting, and that program has been very successful, with only four buildings that have not yet complied. She expressed concern that unsafe URM buildings endanger their neighbors and cause other buildings to be unsafe. She added that private owners of historic structures are committed to restoring rather than replacing their buildings.

Mr. Parness indicated that there were 43 URM's in Napa when the 2000 earthquake hit. By 2009, 39 had complied, leaving only four. He pointed out that three of those are adjacent to each other on one street. Commissioner Macari recommended focusing greater media attention on the success of the mandate and enforcement, as well as the high compliance rate from citizens.

Commissioner Macari asked about the status of the increased river flows as a result of the earthquake. Supervisor Luce said he knew the water level in a nearby creek rose after the earthquake, releasing a large volume of water.

Commissioner Mark Johnson highlighted the speakers' comments about the importance of resiliency, and he noted that some buildings were red-tagged because of their exposure to danger from nearby damaged buildings. He reported that CalOES referred a request from USGS for specific data on the buildings that were red-tagged to city officials.

Commissioner Tracy Johnson asked the speakers how the city and community communicated with citizens after the earthquake and now that system evolved over the following days. Mayor Techel reported that the staff first figured out what resources were available, and they found that electronic media worked well even when much of the town was without electricity. She noted that Facebook became an effective way to deliver messages directly to the community. She said when the media arrived, communication channels became busier and slower, making that process more difficult. Supervisor Luce commented that the City of Napa did an excellent job providing relevant information to the public.

Commissioner Miyamoto asked if inspectors noticed whether the yellow- and red-tagged buildings tended to be strengthened or unstrengthened buildings. Supervisor Luce clarified that the yellow and red tags were used to identify collapse hazards, and that yellow tags could still entail an expensive fix. He said many of the red-tagged buildings were structures that had not been secured to a foundation. He noted that one exception was a brand-new home that was split by the fault rupture.

Mayor Techel stated that she did not know the breakdown, but confirmed that most of the red tags were older construction. She mentioned a recently retrofitted pizza parlor that had no damage.

Commissioner Wheetley encourage the county to make use of Volunteer Organizations Active in Disasters (VOAD) to help organize volunteers in a disaster. Mr. Parnell indicated that the City of Napa has a volunteer center and resource bank, but not a formal organization. He noted that in terms of communication, at first the city tried to disseminate news every few hours. He said that became more problematic over time because independent entities were moving faster and doing press releases about their own activities.

Commissioner Wheetley asked if there were any communication failures. Mr. Parnell replied that the system worked well. He said telephone communications were difficult at times because the system was overwhelmed, and when electricity went out in the switching station downtown, power to the back-up dispatch center was cut, so those facilities had to rely on batteries. He noted that the staff worked quickly with OES to make sure a back-up generator was available. Mr. Parnell observed that Napa had planned for other scenarios, but no one had thought about the potential for losing a switching station. He stated that Napa had not considered plans for relocating hundreds of people who would need to be relocated if a large segment of the mobile home population was red-tagged, but the city was now addressing these issues.

Commissioner Rabbitt thanked Mr. Parnell, Supervisor Luce, and Mayor Techel for welcoming the Commission to Napa. He asked how Napa resolved the problem with the state red-tagging mobile homes.

Mr. Parnell stated that the California Housing and Community Development (HCD) Department was responsible for inspections, but HCD had no enforcement ability, so the city worked with on-site park managers. He noted that most of the problem units had fallen off their foundations or had structural damages requiring utility shut-offs. He reported that the problems were

resolved within the first few days so most people could return to their homes. Mr. Parnell observed that many of the units were simply sitting on pedestals, but they were not tied down.

Mr. Parnell said the city had great support for OES, with about 60 building inspectors and supplemental water crews available within the first two days. He noted 153 water breaks were repaired within five days, and he attributed this rapid recovery to the assistance provided through the mutual aid system.

Commissioner Carbajal thanked the Napa officials for sharing their lessons and experiences with the Commission. He expressed interest in hearing more about the effectiveness of the communications and response system in dealing with vulnerable populations. He pointed out that Napa has a large supply of Spanish-speaking workers in the agricultural industry, and he asked about outreach to those communities. Mayor Techel noted that the voters of Napa recently elected Alfredo Pedrosa to the City Council, an individual with strong connections to local Spanish-language TV stations, and he served as an important liaison with the Latino community.

Mr. Parnell advised that 37 percent of Napa's population is Latino, and 23 percent are immigrants. He noted there is often great hesitancy among that population to call government inspectors into their buildings, for fear of being red-tagged and lacking the resources to relocate. He said the city believes there was considerable under-reporting of damage, so inspectors worked hard to interview citizens and document damage.

Supervisor Luce added that people from Health and Human Services went door-to-door checking on residents.

Commissioner Carbajal asked if there were any particular challenges for senior facilities and hospitals. Mayor Techel said she heard that some local seniors experienced fluctuations in blood pressure levels as a result of the excitement and shaking. Mr. Parnell observed that the care facilities did a great job taking care of their residents. He noted that family members and neighbors in residential areas took it upon themselves to help their vulnerable neighbors.

Commissioner Mark Johnson asked how long it took to understand the magnitude of the event and the extent of the damage. Supervisor Luce recalled that assessment began right away, the EOC was in place on Thursday, and FEMA representatives arrived on Friday. Mayor Techel noted that the earthquake took place on Sunday, and by the end of that day, many residents still lacked electricity, but most of the neighborhoods had been visited and assessed. Mr. Parnell said damage assessments were initiated immediately, so damage reports were coming from all segments of the community by the time the EOC was opened.

Mr. Parnell noted that fires started immediately after the earthquake, and city officials knew the water system had been damaged in many locations, and there was enough damage to downtown buildings to warrant shutting down all the streets pending further investigation.

Commissioner Randall Goodwin complimented Napa for its excellent coordination and programs to improve seismic safety for the region. He said he saw notices almost immediately asking for

inspectors, and he asked how Napa coordinated their efforts and established evaluation criteria. Mr. Parnell said the city's Community Development Director and Building Official set up the program in phases. He noted that for the first few days, inspectors did windshield and visual checks on every building in the city to look for obvious safety hazards. He indicated that they then narrowed their focus to buildings that had apparent problems, and they later accepted calls from concerned building owners who wanted reassurance that their buildings were safe.

Mayor Techel said the city learned from PG&E that communicating with a real person was much more helpful than having a recorder, so staff from the housing department were quickly deployed to answer phones and provide more personal responses. Mr. Parnell noted there were 2,000 calls from people requesting inspections over that period of time.

Mr. Parnell advised that initial inspections were for safety and identified apparent structural issues with foundations, chimneys, and other features that could endanger building occupants. Entry restrictions were posted on each tag, and the inspectors provided data for every address that was loaded into the city's database.

Commissioner Sweiss agreed that emergency preparedness training helps a great deal. He said the more familiar people are with each other and their roles, the smoother the system works in an emergency. He noted that San Francisco has at least 10 or 12 EOC activation drills each year involving different people, and those sessions have been very productive. He encouraged surrounding cities to use drills and exercises to train EOC staff to work together well.

Supervisor Luce expressed support for the concept of involving citizens in a community-wide earthquake simulation drill. Commissioner Sweiss said a number of cities have active neighborhood emergency response teams.

Chairman Strack thanked the Napa representatives for sharing the lessons learned from the earthquake as well as what worked well. He commended local officials for their effective response. Supervisor Luce noted that entire region came together to help, and he expressed appreciation for their assistance and participation.

Chairman Strack commented that California is known for its mutual aid system and neighbors helping neighbors. Mayor Techel invited commissioners to visit her for a personal tour.

Mayor Osby Davis, City of Vallejo, thanked the Commission for inviting local officials to talk about the effects of the Napa earthquake. He said Vallejo opened its EOC within an hour of the earthquake, and the Fire Chief, Police Chief, and Public Works Director arrived immediately to begin answering calls about water leaks, gas leaks, and other urgent problems. He agreed with previous speakers that social media was a faster way than television to obtain breaking news. He recommended exploring wider use of this tool in future disaster responses.

Mayor Davis introduced Fire Chief Jack McArthur and invited him to discuss Vallejo's response in more detail.

Chief McArthur advised that Vallejo opened its EOC in the early-morning hours, and the first incident action plan was released at about 8:30 a.m., followed by a press conference. He reported that Vallejo suffered extensive damage to its water system, a four-alarm fire the following night, and a three-alarm fire the next morning. He said reduced water supply became an issue because of 15 water line breaks and changes in the supply grid. Chief McArthur stated that the city requested assistance from the state in conducting building inspections and damage assessments. He thanked all of the nearby communities that sent inspectors to help. He remarked that technology like iPads can be very helpful in sharing data and communicating with other jurisdictions, and he agreed with previous speakers that social media was the best way to obtain news quickly.

Chief McArthur noted that the buildings on Mare Island serve as a real-life laboratory to observe the performance of reinforced and unreinforced buildings. He said buildings constructed after the 1970's tended to perform better than those built in the 1920's through 1940's.

Chief McArthur noted the city received immediate calls about gas leaks, all from water heaters. He said there was an underground commercial gas leak two days later, and then many reports of structural damage to chimneys and bricks for the next 36 hours. He noted that Vallejo ended up with 121,285 properties that were tagged, including 35 red tags, of which 26 are residential; 431 yellow tags, of which 369 are residential. He observed that the city had to deal with tenant relocation and replacement housing, and a majority of those people were elderly.

Chief McArthur advised that Vallejo's VOAD worked with the city and helped coordinate volunteer response efforts. He said Vallejo sent 80 people to California Specialized Training Institute, an initiative that paid off well during this earthquake.

Mayor Davis summarized the lessons Vallejo learned in the process of responding to the Napa earthquake. He said earthquakes are particularly worrisome because there can cause hidden damage that may not be discovered for many years. He noted that one significant problem is the difficulty of getting accurate damage reports, because many people refrain from reporting damage for fear of being red- or yellow-tagged, requiring relocation and/or expensive repairs. He said the city is attempting to obtain a FEMA disaster declaration so individuals can receive assistance, but that has been a very slow process. Mayor Davis recommended having a direct liaison with FEMA to facilitate the disaster declaration process in the future. He suggested using new technology and social media to provide information directly to FEMA on an ongoing basis so a disaster can be declared without having to wait for written forms and a response.

Mayor Davis noted that many residents with damaged chimney are worried that the next rainy season will bring water damage, mold, and other problems. He emphasized the need to get a disaster declaration as soon as possible so funds can be provided for people who are unable to help themselves.

Mayor Davis remarked that disasters sometimes bring new risks, and he cited the example of unauthorized contractors soliciting high-cost repairs from vulnerable residents. He advocated ongoing communication with the public, using social media as well as more conventional forms of communication. He recommended finding ways of reaching each house affected in a disaster

to check on the safety of the occupants, look for damage and safety issues, and educate them about what to do and where to go for help.

Mayor Davis commented that the value of Vallejo's preparedness efforts and disaster training programs was evident in the effectiveness of the staff and the assistance provided through the mutual aid network. He noted that Vallejo has many old buildings, and it was helpful to have outside assistance in conducting safety inspections. He stressed the importance about being able to communicate, and he advocated using different forms of media and different languages to reach minority communities.

Mayor Davis said the disaster pointed out the resilience of residents, how they try to help each other out, and working together to get things done, the best aspects of human nature. He recommended applying these principles to everyday communications between government agencies and members of the public, and he emphasized the importance of collaboration.

Mayor Davis indicated that his top priority was to obtain a disaster declaration and to encourage everyone to report damage so they can get additional help.

Fire Chief McArthur replied that Vallejo did not lose complete pressure in any of its systems, and water supply issues were limited to Mare Island. He stated that certain parts of the grid were turned off, and then the area was managed by calling in additional companies and doing long relay operations. He noted that Vallejo has a unit that can draft water from the bay and move it inland, but that system was not deployed in this event.

Mayor Davis said the biggest problem related to water was that one of Vallejo's care facilities lost its water supply because of a pipe break, and those damages had to be repaired immediately because there were disabled people in the facility.

Commissioner Carbajal asked if Napa has a 2-1-1 system. Fire Chief McArthur responded that Napa does not. Commissioner Carbajal suggested looking into that program.

Mayor Davis said he was not aware of any reports of water leaks in homes. He reiterated his concern that people would not report such damage for fear of being relocated and unable to afford the repairs.

Chairman Strack thanked the presenters for their time and for sharing their insights.

Chairman Strack invited Commissioner Rabbitt, who also serves as a Sonoma County Supervisor, to address the Commission.

Commissioner Rabbitt introduced Mr. Duane Starns, Chief Building Official, Sonoma County, who was named "Building Official of the Year" by the California Building Officials Association. He said that compared to its neighboring counties, Sonoma County experienced few effects from this event. He reported that two structures were red-tagged, two were yellow-tagged, and there was damage to personal property, and total damages are estimated at about $5.5 million.

Commissioner Rabbit noted that Sonoma County has experience with disasters, but most have been related to flooding from the Russian River. He said Sonoma County opened its EOC after the Napa earthquake. He reported that officials did a quick assessment and determined there was no significant damage to roads, bridges, infrastructure, and major buildings. He noted that Sonoma County dispatched fire crews and building inspectors to help Napa with its response efforts.

For the future, Commissioner Rabbitt recommended enhancing communication capabilities, including bilingual resources, and keeping staff certifications current. He said the county sent letters to owners of all 170 unreinforced masonry buildings in the unincorporated area of the county.

Commissioner Rabbitt advised that he serves as a director of the Sonoma County Water Agency, a three-county system supplying water to about 600,000 people. He noted a quick assessment was done immediately after the earthquake, and all pipelines and facilities performed well. He stated that the Water Agency has regularly scheduled seismic upgrades.

Commissioner Rabbitt said the Water Agency manages two large dams, Coyote Dam on Lake Mendocino, and the Warm Springs Dam on Lake Sonoma. He reported that both were assessed and had no problems.

Commissioner Rabbitt noted that the Water Agency recently entered into a contract for disaster clean-up assistance. He invited Mr. Starns to address the Commission.

Mr. Starns attested to the importance of ongoing training in safety assessments, keeping certifications current, and training new staff architects and engineers. He said responders in the field reported that iPads were a valuable tool in navigating downtown Napa and outlying areas. He noted that responders also found a large number of Spanish-speaking residents who were unable to communicate in English. He recommended preparing a brochure with basic information so people understand what red tags and yellow tags mean, where to obtain additional information, and the distinction between licensed and unlicensed contractors.

Mr. Andrew Healey, resident of Napa, pointed out that the meeting was running at least an hour behind schedule. He asked for assurances that the public comment period later on the agenda would not be cut short. Chairman Strack confirmed that there would be time reserved for public comment.

Chairman Strack welcomed Solano County Supervisor Erin Hannigan and invited her to address the Commission. Supervisor Hannigan explained that she represents District 1, from the Napa County border to Georgia Street in Vallejo, the area where most of the earthquake damage occurred.

Supervisor Hannigan stated that before becoming a county supervisor, she served on Vallejo's City Council. She noted that Vallejo had filed for bankruptcy in May of 2008 and exited bankruptcy in 2011, a difficult period for the city. She said the city continues to be challenged in

terms of maintaining streets and roads, having building inspectors, and providing other city services.

Supervisor Hannigan advised that Measure B, a ten-year one-percent sales tax approved by the voters in 2012, is expected to generate $12 million per year. She indicated that this funding stream has allowed Vallejo to look at its emergency systems and identify needed improvements, including enhanced communications. Supervisor Hannigan said Vallejo has established a robust communication program that makes announcements to citizens via regular emails and newsletters. She agreed that social media is an important way of disseminating information to people affected by disasters. She noted this kind of communication helped keep people away from damaged areas and where to go for assistance. She expressed her appreciation to the voters who approved Measure B.

Supervisor Hannigan reported that the local senior center experienced damage to its ceiling tile grid, which shifted and resulted in the closure of a large room there. She said she heard stories about some landlords who took advantage of the earthquake to try to scare disabled residents into leaving. She noted the Red Cross made sure all buildings were inspected, fed displaced residents, and then escorted them back to their homes.

Supervisor Hannigan informed the Commission that most of the damage in Vallejo was to buildings constructed before 1950 along Tennessee Street, Sonoma Boulevard, and parts of Georgia Street. She said typical damage involved chimneys, wall plasters, ceiling tiles, roofs, and personal property damage. She noted that there are many older buildings in that part of town, and it will be challenging to find funds to repair the damage and make the structures safe.

Supervisor Hannigan said Vallejo has a large church constructed after 1990 that had $250,000 worth of damage because of damage to the fire suppression system. She agreed with previous speakers that under-reported damage could be a problem, and she expressed concern about hidden damage and problems that might occur if there are heavy rains in the months ahead.

Supervisor Hannigan mentioned the Vallejo Earthquake Recovery Group, a community team that will be working with government agencies and other organizations throughout the recovery process.

Supervisor Hannigan noted that Vallejo had a robust neighborhood watch group in the years before its bankruptcy, with over 300 neighborhood watch groups. She said she was struck by Supervisor Luce's comments about neighbors helping and checking on each other after a disaster. She observed that this disaster highlights the need to promote neighbor watches for safety and crime suppression, as well as responding after disasters. Supervisor Hannigan stated that Vallejo's community emergency response teams (CERT's) were not deployed because damage in Vallejo was relatively limited, but the CERT's are another resource that should be used.

Supervisor Hannigan confirmed what Mayor Davis said about the need to obtain a disaster declaration to facilitate repairs and recovery.

Mr. Don Ryan, Emergency Services Manager, Solano County Sheriff's Office, reported that he was in Massachusetts on the morning of the earthquake, and the first he became aware was when he received a message from the Red Cross about opening a shelter in Solano County. He said the county also has an active VOAD.

Mr. Ryan reported that Solano County immediately activated its EOC. He said Solano County is fortunate to have a 2012 emergency operations plan that includes checklists and a multi-hazard mitigation plans that identifies risk areas. He indicated that he used this information to dispatch search and rescue teams and damage assessment teams to inspect levees, roads, bridges, and other critical structures. He noted that the earthquake damage in Solano County was concentrated in Vallejo, so the county deployed most of its resources there. Mr. Ryan estimated there was about $1.8 million total damage to county buildings in Vallejo, as well as superficial damage to a garage in Fairfield. He said the most expensive item is replacement of a large chiller on a county building. He stated that these buildings were all closed temporarily and are fully open now, continuing to deliver services to citizens within a few days.

Mr. Ryan observed that if rains come, the outer shells of all damaged buildings will need to be sealed to prevent water damage. He said although residential damage was minimal, the staff continues to get some calls. He added that he received a call the previous day from the owner of a house on pilings that experienced some serious foundation problems.

Mr. Ryan commented that California's mutual aid system is very strong, and firefighting strike teams of people from other counties were mobilized in Napa and Vallejo immediately after the earthquake. He said his goal now is to obtain individual assistance funds and get houses rebuilt through Vallejo's VOAD program, and he reported that process was underway.

Chairman Strack thanked the Vallejo presenters for their remarks.

Chairman Strack welcomed Ms. Tracy Crumpton, of Senator Sandra Wilke's office, who relayed three questions from the senator. First, she questioned whether current seismic standards and implementation for housing and buildings were adequate. Second, Ms. Crumpton asked if there were particular barriers to better seismic safety, and, if so, what can be done to provide better results for people, buildings, and historic buildings. Third, Ms. Crumpton noted, Senator Wilkes suggested looking at insurance and insurance practices to determine whether they are adequate for policy-holders, and to identify barriers that prevent people from purchasing insurance they may need.

Ms. Crumpton offered her assistance and confirmed Senator Wilke's interest in moving forward with seismic safety improvements.

Chairman Strack welcomed Mr. Charles Rabamad, Assistant Director, California Office of Emergency Services, Recovery Section, and Mr. Steve De Blasio, Federal Emergency Management Administration, Region IX Federal Coordinating Officer.

Mr. Rabamad thanked all of the first responders and everyone else who worked long and hard hours to ensure public safety after the earthquake. He noted it had been over a decade since this

area experienced strong earthquake shaking, but local jurisdictions responded efficiently and effectively. He reported that CalOES's Recovery Section immediately deployed many staff and managers to assist the affected counties, including over 60 safety inspectors, a debris removal specialist, inspectors who specialize in public assistance and individual assistance, an expert in donation and volunteer management to work with local VOAD's and faith-based organizations.

Mr. Rabamad noted that immediately after the event, CalOES realized that this disaster would require immediate assistance from state and federal response agencies, so CalOES contacted FEMA Region IX and invited them to conduct preliminary damage assessments for both public assistance and individual assistance. He said the first preliminary damage assessment took place the fourth day after the earthquake, the public assistance assessment was completed in about two days, and the president issued a declaration pertaining to the public assistance side. Mr. Rabamad added that local jurisdictions are still waiting for individual assistance to be approved as well.

Mr. Rabamad reported that although there were some minor glitches during the response process, there were some constructive lessons learned from the South Napa earthquake. First, he noted, the prompt and swift actions of local jurisdictions allowed CalOES to better coordinate resources. He expressed his appreciation for the professional staff assistance provided by local governments. Mr. Rabamad acknowledged there was some duplication of efforts in the damage assessment process, and tagging of homes for safety was inconsistent. He observed that there are discrepancies between the FEMA and SBA standards and definitions, and these differences caused some confusion.

Mr. Rabamad commented that affected local jurisdictions were still in the response mode when the CalOES damage assessment process was initiated, and he questioned whether it might be better to wait a bit instead of beginning immediately. He recommended that local jurisdictions update the lists of tagged buildings periodically. He noted some structures were inspected twice, so better coordination would have been helpful. Mr. Rabamad said local jurisdictions should develop a debris removal plan that identifies disposal sites, how debris will be managed, and the types of material handled.

Mr. Rabamad indicated that Standardized Emergency Management System (SEMS) reporting responsibilities were problematic for CalOES and locals after the disaster, and he recommended working on this. He said having a clear understanding of insurance policies and coverage details is very helpful.

Mr. Rabamad identified a series of proposed next steps. He said CalOES should provide comprehensive training on SEMS, conducting the preliminary damage assessment for public and individual assistance, debris management, the safety assessment process for tagging homes, individual assistance programs, and public assistance programs. He reported that CalOES and FEMA will soon be signing an agreement with the State Historic Preservation organization to facilitate retrofit projects for historic buildings. Mr. Rabamad said CalOES is also working with FEMA to find ways to fund improvements that go beyond current standards.

Chairman Strack thanked Mr. Rabamad for his remarks.

Mr. De Blasio thanked the Commission for inviting him to speak. He noted that this disaster clearly shows the ability of local governments to coordinate with other agencies during response and recovery efforts. He offered FEMA's ongoing support and assistance. Mr. De Blasio reported that FEMA provides staff liaison officers at the state level, and FEMA division supervisors often assist at the local level.

Mr. De Blasio reported that after the earthquake, FEMA received a request for public assistance and individual assistance. He said the president granted public assistance on September 11 and appointed him as the federal coordinating officer for the event. Since then, he noted, the state has conducted the applicants' briefing, and then FEMA began a series of kick-off meetings. Mr. De Blasio stated that as of this date, 13 kick-off meetings have been completed and a list of potential projects is being developed. He advised that there had been 30 requests for public assistance so far.

Mr. De Blasio remarked that the emphasis of the assistance program is not just to rebuild, but to rebuild smarter, more resilient, and more resistant to the next disaster. He stated that FEMA 406 mitigation funds are available for reconstruction to current standards. He added that FEMA is placing a huge emphasis on preserving important historical and cultural resources.

Mr. De Blasio said the state and FEMA have done the best job possible to request the administration's approval of individual assistance for recovery from this disaster. He commended community organizations, local governments, and state agencies in California for working together to improve seismic safety.

Chairman Strack thanked Mr. Rabamad and Mr. De Blasio for their remarks.

IV. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)/JET PROPULSION LABORATORY (JPL) OBSERVES THE NAPA EARTHQUAKE WITH SPACE TECHNOLOGY: IMPLICATIONS FOR THE FUTURE

Dr. Susan Owen, Satellite Geology and Geodynamics Systems Group, NASA/JPL, gave a presentation showing data about the South Napa earthquake that was obtained with new technology developed by NASA and JPL. She displayed a map showing the location of the earthquake and its relative size.

Dr. Owen reviewed a timeline illustrating JPL's response to the earthquake. She noted that automatically-generated models were created within a few hours, and the California Earthquake Clearinghouse was activated in the morning. She said JPL uses global positioning system (GPS) data to measure how much the earthquake changed and moved the surface of the earth, which helps scientists understand how the fault moved underneath the ground, generating a fault model. Dr. Owen advised that the first space-based observations were available in three days. By the end of the week, she noted, JPL was able to capture an image of the Napa area with an airborne instrument, Unmanned Arial Vehicle Search & Rescue (UAVSAR).

Dr. Owen reviewed and discussed the data products JPL provided and how they were used. She showed examples of the models that were generated shortly after the earthquake and provided to the California Earthquake Clearinghouse, included a damage assessment based on the seismic data, and application of the HAZUS screening program to provide a detailed estimate of where the damage occurred. She noted that by the second day, JPL had actual observations and measurements of ground movement. Dr. Owen displayed graphs depicting levels of displacement and ground motion at the GPS stations. She said GPS data in the ensuing days showed considerable motion on the fault after the initial rupture.

Dr. Owen showed radar images depicting levels of motion throughout the area. She noted geologists can use this data to go to specific sites in the field to identify additional surface ruptures that might affect water lines and other infrastructure.

Dr. Owen discussed JPL's technology for estimating earthquake damage. She said radar images clearly showed extensive damage in the local mobile home park, but more localized damage and interior damage is harder to spot. She displayed images obtained from UAVSAR, JPL's airborne instrument, showing surface faulting in greater detail. She noted that this information was used in deploying response resources to the areas where they were most needed.

Dr. Owen stated that UAVSAR data is also helpful in assessing levees, and she talked about a JPL project run by Kathleen Jones to monitor levees using UAVSAR data. Following the South Napa earthquake, she said, Ms. Jones imaged areas close to the earthquake and helped the Department of Water Resources confirm the stability of certain levees and target areas prone to liquefaction.

Dr. Owen mentioned that JPL has other projects that can be used for earthquake response, but were not needed in this earthquake, such as the Finder system, which uses microwave radar technology to detect live heartbeats of people trapped in collapsed buildings. She said JPL is also looking at other types of technology for hazard assessment, mapping fire danger hot spots, and mapping damage following fires.

Dr. Frank Webb, Satellite Geology and Geodynamics Systems Group, NASA, clarified that the UAVSAR is a NASA G-3 Gulfstream 3 aircraft instrumented with equipment developed by JPL. He said potential users must submit requests, and NASA screens, selects, and prioritizes eligible projects.

Commissioner Mark Johnson explained that the California Earthquake Clearinghouse is a coordinated effort of the California Geological Survey, USGS, the Seismic Safety Commission, and the Earthquake Engineering Research Institute. He said the clearinghouse mobilizes after a serious earthquake to provide intelligence to state operations centers and help with damage assessment and deployment of resources. Dr. Owen noted that JPL begins mobilizing resources immediately and submits information immediately to the clearinghouse once activated.

Chairman Strack thanked Dr. Owen for her report.

V. ENGINEERING IMPLICATIONS OF THE SOUTH NAPA EARTHQUAKE

Chairman Strack welcomed Dr. Steve Mahin, Director, Pacific Earthquake Engineering Research Center (PEER), and invited him to address the Commission.

Dr. Mahin said he was humbled to be included with the many distinguished speakers who were addressing the Commission at this meeting, and he noted that his presentation would focus on engineering implications and interpretations of what was observed in the South Napa earthquake. He added that he hoped to make recommendations for how structures can be built to be more resilient in future disasters.

Dr. Mahin remarked that the goal of earthquake engineering is to make structures better and safer, so much can be learned from earthquakes as they occur. He expressed his appreciation to the officials and citizens in the Napa area for sharing information and making this the most well-documented earthquake in several decades. As a result, he said, this earthquake provides an opportunity to communicate with public officials about the consequences, intents, and remedies associated with earthquake engineering.

Dr. Mahin reported that in the weeks since the earthquake, Earthquake Engineering Research Institute (EERI), Pacific Earthquake Engineering Research Center (PEER), and other organizations have had field reconnaissance teams at the site, and because the site was already well-instrumented with ground motion sensor equipment, a great deal of information was available to instruct the town and citizens about the size and type of earthquake that occurred. He noted that California is in the beginning stages of developing an earthquake early warning system, and this earthquake provided data that identified opportunities and issues that should be addressed moving forward.

Dr. Mahin commented that there are exciting new tools to document the behavior, response, and performance of structures, and he mentioned street-mounted 3-D high-resolution laser and Light Detection and Ranging (LIDAR) scanners, a high-resolution street-view movie camera, and a drone that can be deployed to fly over and film affected areas that are too dangerous for humans.

Dr. Mahin advised that the South Napa earthquake was not a surprise, as the fault system was identified on USGS maps prepared in 2008, and updated maps would show a network of active faults. He observed that before this information became available in 2008, many people had already built on the faults in the area, but building along known faults is contrary to the Alquist-Priolo Act, so building there in the future would be prohibited. He demonstrated how a specific building address can be identified on the United States Geological Survey (USGS) map to identify its proximity to a major fault. Dr. Mahin pointed out that the meeting location was within 150 feet of the fault trace.

Dr. Mahin drew attention to a USGS chart showing the probability of a 6.6-magnitude earthquake near Napa, and he reviewed past earthquakes in the area. He showed a shake map of the recent earthquake. He pointed out that although the consequences of the earthquake were devastating for Napa, the damage would have been far greater in an large urban area where more people would be affected.

Dr. Mahin indicated that USGS and other research organizations have a range of seismic instrumentation in the area around Napa, and he displayed a map showing the locations of ground-motion sensors. He noted that peak ground accelerations tend to be around 30 percent to 50 percent of the acceleration of gravity, but at the Carquinez Bridge, accelerations up to 1 g were recorded. Dr. Mahin showed a graph of engineering models predicting displacements and structural performance in an earthquake this size, and he pointed out that the actual results are very close to what was expected in a magnitude-6 earthquake.

Dr. Mahin said engineers always want to know if buildings behaved as expected. He showed graphs illustrating the strength of old buildings in downtown Napa compared to a structure built under current building code standards. He then showed actual results, and noted the actual results were very close to the design-level earthquake.

Dr. Mahin advised that the South Napa earthquake caused considerable damage to low-rise buildings in downtown Napa, but buildings at Napa Valley College had less damage. He noted there was significant damage to winery facilities, especially to stacks of wine barrels, and the areas north and south of town had damage to taller structures. He commented that the ground motions produced by this earthquake are not "The Big One," nor are they small. He said he understood there were about 150 red-tagged buildings, 1,500 yellow-tagged buildings, and damage seems to be associated with the age and type of structures, soil conditions, and ground motions.

Dr. Mahin displayed a map of the damage, and noted the linear delineation of damage in the narrow strip on top of the fault rupture. He said cracks in garage floors and foundations can be observed along the entire fault, and he emphasized the importance of mapping all faults in buildable areas so future construction can be avoided.

Dr. Mahin described damage to single-family residences near downtown Napa, particularly wood-frame buildings constructed many years ago. He showed photographs of damage to porches, stairways, foundations, and gas meter connections. He noted that LIDAR scans identified points where buildings had become displaced, and those are being monitored for additional movement over time. Dr. Mahin displayed a photograph of a newer wood building near Fire Station Number 3 that sustained stepping damage, nail displacement, and cracking.

Dr. Mahin showed pictures of other retrofitted buildings that performed very well in the earthquake. He noted a number of other building owners are retrofitting their buildings now, and many more are expected to undertake strengthening in the future.

Dr. Mahin talked about damage to tilt-up buildings and warehouse facilities where roofs can become detached from walls. He showed pictures of wall and ceiling failures at a large chain grocery store and warehouses containing wine barrels. He recalled that the Commission heard a presentation several years ago about the risk of damage from stacked wine barrels, and many wineries suffered product losses and economic damages. He observed that the timing of this earthquake was fortunate, because many more people would have been at risk if the earthquake occurred during working hours.

Dr. Mahin said many mobile homes moved off their foundations, a gas line broke and started a fire, and other damage resulted from water damage.

Dr. Mahin reported that lifelines in the Napa area generally performed well. He said many state and county bridges had been retrofitted and fared well. He noted there was concrete spalling damage to the Napa Slough bridge, one of a few bridges that had not been retrofitted. He pointed out that the success stories illustrate the value of properly engineered retrofitting.

Dr. Mahin noted that underground lifelines were damaged because of ground movement, and he showed slides depicting water line breaks and damage to a water storage tank roof that have resulted in reduced pressure to certain areas while repairs are done. He stated that 90 percent of the water mains in Napa are more than twenty years old, and 44 are made from cast iron. He said 75 percent of the water mains that broke were made from cast iron, with almost one break per mile of pipeline in the system. Dr. Mahin observed that more modern ductile iron or steel pipe would have about one seventh of that rate of damage. He emphasized the importance of maintaining a reliable and safe water supply for firefighting, drinking, and recovery. He urged local communities to consider upgrading their water systems before the next big earthquake.

Dr. Mahin advised that more than 50 percent of water service was restored in five days, and 90 percent was back in service in about two weeks. He said electricity and gas systems worked well. He noted that electric power was restored to 90 percent of customers within about 20 hours, and the remaining power was restored over the next few days. He observed that there was less natural gas damage than many people would have thought. Dr. Mahin reported that there were breaks in sewer treatment pipelines, especially near the area of fault rupture, and the wine released into the wastewater system disrupted operations of the treatment plant for 24 to 48 hours as the acid in the wine was gradually neutralized.

Dr. Mahin said a piece of cladding fell off an AT&T facility and landed on a transformer, so emergency generators were brought in to reinforce battery power.

Dr. Mahin cautioned that the risk of earthquakes has not gone away, so the region can expect future events that may be larger. He noted that Napa's successful response efforts might not be replicated in a larger earthquake in an urban area. He said although life safety is paramount, community leaders are concerned about the extent of damage in Napa, and he encouraged local jurisdictions to work to improve their resiliency and ability to recover quickly.

Dr. Mahin noted that this earthquake provided a reminder that people should avoid building on earthquake faults, and he advocated updating fault maps. He said there are many types of buildings with known hazards, but this earthquake highlighted the danger from falling hazards from adjacent buildings. He also stressed that all retrofits are not equal, and buildings strengthened twenty years ago are not expected to perform nearly as well as those done last year, and a $15,000 project will not perform as well as a $50,000 improvement. Dr. Mahin said this earthquake shook newer structures, but not to their design levels, so most of the damage was to nonstructural components. Last, Dr. Mahin recommended continued scrutiny and attention to upgrading lifelines to preserve services after a disaster. He pointed out that a city cannot live

without business, housing, and public services, so rapid recovery and continued functionality is important to everyone.

Dr. Mahin advised that that there has been great progress in understanding earthquakes and ground motions from an earth sciences perspective. He noted levels of shaking can vary, depending on proximity to the fault rupture, soil conditions, and other factors. He acknowledged the possibility of aftershocks for some time after an earthquake. Dr. Mahin recommended using the lessons learned about structural performance to improve methods for analysis, design, and retrofit.

Dr. Mahin reported that he looked at two schools in detail, and both had no visible damage, despite substantial damage to nearby houses and businesses. He said the lesson is that good engineering, sound criteria, and thorough inspection are useful and successful.

Commissioner Widom noted that San Francisco is considering adopting a higher standard for private schools as well, a controversial issue because of the potential financial impacts. He clarified that current building codes are designed to save lives, not to maintain buildings. He said building to a higher standard is more expensive, so many buildings are designed to minimum standards, not as the best design.

Commissioner Macari thanked Dr. Mahin for his presentation. He observed that the message is clear that people should not build on faults, but the problem is that many faults are not well known or documented until something occurs. He expressed support for remapping using modern technology to detect and map more faults. He asked Dr. Mahin to comment on the status of fault mapping.

Dr. Mahin replied that many earthquakes have been on faults other than major ones like the San Andreas. He said understanding where other faults are is very important, and he recommended having field geologists interpret the data. He noted that in many areas, like Berkeley, 20 feet of fill soil have been placed over the fault, making it more difficult to see. Dr. Mahin suggested using tools like ground-penetrating radar, computational tomography, and looking at micro-tremors as ways to supplement information available from other sources.

Dr. Mahin noted there have been questions as to what engineers can do to resolve problems with building on faults. He stated that there are ways of designing foundations to make structures more robust and better able to withstand strong motion. He said New Zealand residents reported differential movement because of liquefaction and landslides and other soil problems, and those issues also need to be considered carefully.

Chairman Strack thanked Dr. Mahin for his presentation.

VI. PERFORMANCE OF EARTHQUAKE EARLY WARNING SYSTEMS FOR THE SOUTH NAPA EARTHQUAKE, CALIFORNIA EARTHQUAKE EARLY WARNING SYSTEM PARTNERS

Chairman Strack welcomed Dr. Richard Allen, Director, UC Berkeley Seismological Lab.

Dr. Allen thanked the Commission for inviting him to speak. He said that although he considered himself to be an earthquake professional, he was honored to be present to hear the comments of people who responded to the earthquake, and he looked forward to hearing public comments as well.

Dr. Allen noted that he was speaking on behalf of the team of people working on developing the Shake Alert earthquake early warning system, an effort was funded largely by the Gordon and Betty Moore Foundation and USGS. He played a short video of MSNBC newscaster Rachel Maddow explaining the purpose and benefits of an earthquake early warning in the aftermath of the Napa earthquake.

Dr. Allen provided an overview of how the Shake Alert system worked in the Napa earthquake. He noted the Shake Alert system makes use of the state's existing seismic networks that stream data to processing centers that share information and alerts statewide. He clarified that this is a demonstration system, not a fully robust and workable public system. Dr. Allen said the alerts are delivered to a range of external users, including BART, the City of San Francisco, UC Berkeley, emergency response groups, local governments, airports, and private-sector companies.

Dr. Allen stated that the Napa earthquake occurred at 3:24 a.m. on August 24. He played a recording of the alert received by the San Francisco 9-1-1 center on Turk Street. He said the amount of warning depends on distance from the earthquake. He displayed a map showing the epicenter of the earthquake and the warnings received by recipients in the area. Dr. Allen noted that the UC Berkeley Police Department had a 5-second warning, BART had 8 seconds, and the City of San Francisco had 9 seconds, not a great deal of time, but enough to take protective actions. He added that researchers are working hard to increase the warning times.

Dr. Allen observed that Shake Alert has now been operating since 2012, issuing alerts for many earthquakes. He said the governor signed the earthquake early warning law last September, launching the effort to create a statewide early warning system. He noted that CalOES is charged with developing a comprehensive statewide system, including standards and a mechanism to review compliance, and identifying a source of funding other than the general fund. He observed that the law was passed unanimously, but no funding has been identified.

Dr. Allen described the key elements of the new statewide system. He said the earthquake early warning system needs to be the product of a public-private partnership that takes the best of both components. He emphasized the importance of leveraging the state's existing seismic network, comprising 400 stations that are already streaming data to Shake Alert, creating additional stations to fill gaps, and upgrading older facilities. Dr. Allen noted the system consists of a network of instrumentation that streams data to a parallel statewide processing center, and the centers then push out alerts in many ways so they reach as many users as possible. He said the alerts also need to be pushed out to the public via different forms of media.

Dr. Allen noted that the private sector can play an important role in terms of providing additional data to the system. He said several private companies with seismic instrumentation in the field

have already joined the Shake Alert network so they can participate in the early warning effort and integrate their data with the rest of the system.

Dr. Allen indicated that the cost of the public piece of the partnership effort is estimated at $18 million, including building on top of the existing state network and operating the new system for the first five years. He said integration of the system will provide faster and longer warnings, especially to people within the immediate vicinity of an earthquake epicenter. He noted that funding will be used for new hardware and installation of new seismic monitoring stations to fill current gaps, and the resulting integrated network will be much more robust.

Chairman Strack said his understanding was that the public piece of the system had not yet been decided, and Dr. Allen confirmed that understanding. Chairman Strack expressed concern about the possibility of false alarms and how they can be avoided. Dr. Allen explained that users can choose the threshold for alerts. He noted that some users, such as Cal Tech, have their system set up to alert for every earthquake, and the system estimates the time until the S wave arrives at that location, and how much shaking will occur at that location. He said the system can detect earthquakes of 2.5 magnitude, but it is set to respond to earthquakes above magnitude 3. He commented that when delivering the system statewide to the public, the state will need to choose the appropriate alert thresholds for various users.

Chairman Strack observed that there still needs to be a significant amount of policy discussion with government leaders about what notifications will look like as the system is rolled out to the public. Dr. Allen clarified that his role and that of the other seismologists on the team was to detect earthquakes accurately and generate alerts; he pointed out that how the alerts are used is an entirely different domain. He added that the earthquake science community and the emergency response community are just starting to grapple with these issues.

Dr. Allen responded to the concern about false alarms by citing the experience of Japan's nationwide earthquake early warning system. He said they defined a threshold of issuing alerts for all earthquakes with an intensity greater than 5. He noted that when the data from a period of time was examined, they found that 20 alerts were issued, there was one false alert, and one missed alert. He explained that the false alert was a situation where peak ground shaking was predicted as 5, but it turned out to be 4, and the missed alert was a case where the strongest shaking was expected to be 4, but actual shaking was 5. He pointed out that the false and missed alerts are very close to the threshold line.

Commissioner Macari expressed his opinion that early warning systems have useful applications for certain locations and for certain examples, but it is way too early to try to get the public excited about the system's development. He acknowledged that the parameters of the system will have to be a policy decision, and the state will have to decide how much it wants to spend and what level of safety it can achieve. He said many people are also interested in developing ways of predicting earthquakes, a topic that has been researched for decades but remains unsolved. Dr. Allen remarked that it is unlikely that prediction technology will be available in the foreseeable future.

Dr. Allen confirmed that there are existing earthquake early warning systems that work well, but he cautioned that they are not a panacea for dealing with earthquakes, and they also bring their own challenges and limitations. He acknowledged the possibility of false alerts and errors, noting that this system and any engineered system will always have problems. He recommended working through the process of figuring out how to intelligently use the technology and identifying the applications that make sense. Dr. Allen cited BART as an example how alerts can be used to slow and stop trains and restart them when the system is safe.

Commissioner Tracy Johnson commented that it was easy for BART to decide to participate in the pilot program because the consequences of a false positive were relatively easy to absorb. She noted that riders of commuter trains are accustomed to frequent slow-downs and delays.

Commissioner Gardner said the question of how the alert system should be used is a policy decision, not a technical matter. He noted that it was fortunate gas meters in Oakland and Berkeley were not shut off because of the Napa earthquake, and stopping railroad trains would have caused additional problems. Commissioner Gardner pointed out that these are the kinds of issues and concerns that need to be considered by policy makers. He observed that special attention needs to be given to how the system will be introduced and explained to the public. He added that finding money to get the system in place will take place, but deciding how best to use it will be the bigger challenge.

Dr. Allen noted that regional shake maps can be developed before shaking occurs so local jurisdictions and emergency responders can estimate where shaking will be strongest.

Chairman Strack stressed that the state needs to be mindful of how it communicates with the public, both in terms of policy and in terms of science. He said policy-makers need to be prepared to inform the public and define their expectations of the system. He added that there is timeline for developing the system, so the policies and public outreach plans should be ready.

Commissioner Hellweg encouraged scientists, elected officials, and members of the public to talk about the earthquake early warning systems to raise awareness of their benefits and attract funding. She acknowledged that developing a good system will take considerable time and effort, and she recommended working hard now so a system is in place before the next big earthquake.

Commissioner Sweiss noted that along with rolling out an alert system, the state needs to tell people what to do when they receive a warning. He suggested tailoring messages for emergency responders, students in schools, and families at home. Dr. Allen agreed, and said the rollout of the system presents a huge opportunity for education about early warnings, as well as broader information about earthquake preparedness and response.

Chairman Strack introduced Mr. Michael Price, Chief Technical Officer, Seismic Warning Systems, the company whose early warning system was up and activated during the Napa earthquake. He invited Mr. Price to discuss the performance of the warning system in more detail.

Mr. Price stated that Seismic Warning Systems started doing research in earthquake warning in 1995 and produced its first products in 2000. He said selling these products to people in 2000 was quite challenging, because few people had ever heard of such technology or its benefits. He described how alerts are especially useful to fire stations so they have time to open their doors and get equipment out. Mr. Price showed a photograph of a typical device in 2001 and pointed out the components. He noted the systems were installed in hospitals, schools, and offices.

Mr. Price said the City of Vallejo has Quake Guard systems in their fire stations as a result of lessons learned from the Loma Prieta earthquake. He explained that a fire station close to the collapsed Cypress Freeway in Oakland were unable to open the jammed doors to remove the trucks and assist with rescuing people. After that, Fire Chief Don Parker ordered systems for all stations in Vallejo, and there were five in operation at the time of the Napa earthquake.

Mr. Price showed a map of the earthquake and identified the locations of the instrumented stations. He said the system can distinguish between seismic motions and other kinds of motions, and it can also distinguish between large and small earthquake. He reported that there were between 1.7 and 2.4 seconds of warning in Vallejo before the S wave from the Napa earthquake arrived at the sensor-equipped fire stations. At each station, he noted, the doors opened, and an audio alert was produced to awaken the firefighters. He said one station lost power immediately after the alert, so their door was only partially opened. Mr. Price emphasized the importance for first responders and medical facilities of having a back-up power supply.

Mr. Price said there are fire stations in Albany and Berkeley that are also equipped with Quake Guards, but the intensity was too slight there to generate alerts. He remarked that in the thirteen years the system has been in place, there have been no false alarms.

Mr. Price displayed a map showing locations where buildings were red-tagged in Vallejo, and he noted that most of them are close to fire stations. He said this led some neighbors to wonder why the alert system could not be used to warn people in the community.

Mr. Price showed a diagram illustrating the components of the early warning system and explained how the warnings were generated and disseminated. He noted that the amount of warning possible depends on proximity to the epicenter, which, in the case of American Canyon, would have been about is second. He observed that even one second is enough time for some safety precautions.

Mr. Price said that Seismic Warning Systems hopes to build a network of Quake Guards that will be integrated in an array that will provide longer warning time to users. He noted that the goal is to create a system that works everywhere, in all types of facilities. He added that the product has always been focused on taking action that will improve resiliency.

Mr. Price reported that Seismic Warning Systems is partnering with the Coachella Valley Association of Governments and Imperial County to build a regional early warning system that involves placing Quake Guards in areas along the faults and distributing warnings to public facilities, including schools, fire and police stations, emergency operations centers, hospitals, water facilities, and other users. He said Seismic Warning Systems raises private capital to

building the system and earns revenues from selling products from commercial end users to pay for operations and maintenance, so the warnings can then be provided to user public facilities for no ongoing cost to them. Mr. Price observed that facility owners are responsible for the safety of the people in their buildings, so it would be prudent for owners of hotels, conference centers, and other businesses to provide alerts to building occupants so they can take protective action, and facility owners can take advantage of this opportunity educate their guests by telling them how to respond to an alert.

Mr. Price said Seismic Warning Systems was part of a statewide working group formed about two years ago to define what it would take to get an earthquake warning system going in California quickly, and company representatives have been participating on committees looking at various aspects of the system. He noted that industry can play an important part of the state's early warning system, and bringing modern technology to bear on seismic issues will be very valuable. He advocated building on the investments that have already been made in these areas and creating a system that can deliver reliable earthquake warnings to everyone.

Mr. Price commented that after the Napa earthquake, fire stations in Vallejo equipped with Quake Alert systems reported that the alert helped them avoid delays in deploying fire engines and protecting facilities. He observed that the next step will be to extend these kinds of protections statewide. He expressed his company's commitment to continue working with the state to combine efforts and come up with the best solution possible, and as soon as possible. Mr. Price pointed out that working technology is available now, so the remaining issue is how the system can be integrated into society so it becomes part of everyday life.

Commissioner Carbajal asked about the costs of the Quake Alert units. Mr. Price responded that the typical cost of an audio alert subscription for a small office would be about $1,200 per year. He added that systems to control industrial operations and more complicated functions would cost more.

Executive Director Richard McCarthy asked how the alert signal is translated into action. Mr. Price explained that the company works with its customers to identify potential applications, based on an understanding of their vulnerabilities. He remarked that a drop-cover-hold response would be appropriate when strong shaking might cause things to fall. He said customers seeking control applications want to identify what machines or processes are vulnerable, and then how to control those that have some impact. For example, Mr. Price noted, the alert could be used with a valve shut-off application to prevent spills and avoid clean-up costs, so the company works with the customer to calculate expected intensity level and peak ground acceleration would be likely to cause damage. He said the company provides a cost-benefit analysis comparing the costs of shutting down versus the value of staying open and possibly sustaining earthquake damage.

Mr. Price clarified that Seismic Warning Systems was not planning to use Quake Guards at customer sites to build a network. He noted that subscribers are not necessarily located where it would be most advantageous to have a sensor, so the company will evaluate a region and decide how to place sensors to maximize the amount of warning that can be produced, given assumptions about where earthquakes are likely to be.

Commissioner Miyamoto suggested using public and private schools as potential sites because they are widespread across the state. Mr. Price agreed that schools would be good places to install sensors. He noted that all three of the public school districts in the Coachella Valley are involved in the pilot project, and sensors will be placed in some school sites, as well as a server somewhere in a school district facility.

Chairman Strack thanked Mr. Price for his presentation and said the Commission looks forward to working together on the development of California's earthquake early warning system.

VII. BUILDING RETROFITS, DAMAGE & BUSINESS CONTINUITY ISSUES

Chairman Strack welcomed Ms. Maryann Phipps, President, EStructure, and invited her to address the Commission.

Ms. Phipps thanked the Commission for inviting her to speak. She said she was a practicing structural engineer and served as co-leader of FEMA's data-gathering effort after the Napa earthquake that involved investigating all of the buildings within 1,000 feet of the strong motion device on Main Street in Napa. She noted that she and other design professionals want to learn as much as they can from this earthquake so they can improve their practices.

Ms. Phipps began by saying that every earthquake seems to have a signature issue: for the San Fernando earthquake, it was nonductile concrete buildings like the Olive View Hospital; for Loma Prieta, it was soft-story buildings and liquefaction; and for Northridge, it was steel moment frames. For the Napa earthquake, she predicted, the main lesson would be about retrofitted unreinforced masonry buildings (URM's). Ms. Phipps stated that Napa has many URM's, and a large subset of them were retrofitted in accordance with an ordinance. She noted the stated objective of Napa's ordinance was to reduce the risk of death or injury.

Ms. Phipps showed slides of damage to URM's that had not been retrofitted, and she pointed out a collapsed brick wall inside a restaurant. She noted that some buildings sandwiched between two other buildings were lucky and sustained little or no damage because they were supported by their neighbors.

Ms. Phipps displayed pictures of retrofitted buildings that performed well in the Napa earthquake. She said there was some damage, but none of the buildings collapsed, and the retrofit work reduced the potential life loss significantly.

Ms. Phipps noted that the Vintners Collective building did not do well, but she was told the stone wall were 20 inches thick, and anchors went in about 10 inches, so there was a great deal of stone on the building that was not tied to either the floor or the roof. She said there was another building with insufficient steel and anchoring support to capture falling brick masonry.

Ms. Phipps reported that some stone was lost from the cornice piece of the tower of the Goodman Library, a beautiful historic building. She indicated that the engineer of record supposedly planned to remove the piece for strengthening and then put it back, but that work was

never done. She added that although the falling stone had the potential of causing a casualty, the building can be saved.

Ms. Phipps showed a slide of building with interior steel moment frames and severe damage on side brick walls. She said she was told the design and construction had some deficiencies, and the building performed so poorly it will be closed for a long time so the strengthening can be redone. She remarked that even though no one was killed, poor-quality retrofits can pose a big risk to building occupants.

Ms. Phipps said the issue of adjacency has been highlighted a great deal in the Napa earthquake, because of damage done to some retrofitted buildings from the condition of their neighbors. She showed a slide of a building was red-tagged and had to construct a barricade on top of the building to prevent brick from posing a hazard to the building below.

Ms. Phipps commented that brick chimneys collapse in every earthquake, causing considerable threat to life and property damage, so it is surprising they are still so prevalent. She recommended doing something to address this dangerous hazard. She pointed out that there has been a great deal of attention to cripple walls, but chimneys are equally important. Ms. Phipps noted other classes of buildings that are also vulnerable, including tilt-ups.

Ms. Phipps reviewed the performance of recently constructed buildings. She showed slides of a stone veneer that fell from a 2008 building, which also had cracking of stucco, and bowing and gaps in walls. She noted that Structural Engineer Fred Turner reported that the exterior wall moved about 12 inches relative to the steel moment frame. Ms. Phipps observed that this is an example of bad detailing to accommodate the drift of the moment frame and protect the exterior wall in anticipation of that movement.

Ms. Phipps talked about damage to the new Andaz Hotel, including loss of adhered veneer on the exterior, falling mirrors and artwork inside, movement of televisions and furniture, damage to sheetrock, and water damage. She noted that the extent of nonstructural damage resulted in the hotel being out of service for some time.

Ms. Phipps stated that not all water damage was caused by fire protection system piping, but most of it was. She showed photos of cracks and breaks in pipes that released torrents of pressurized water that was difficult to turn off. She said water flowed for a long time in a number of buildings, causing a tremendous amount of damage.

Ms. Phipps noted the Napa County offices building is a two-story, tilt-up that was structurally unscathed, but one sprinkler head just below the roof went off, and water flowed for five hours, ruining sheetrock, floor coverings, ceilings, and building contents.

Ms. Phipps said McCaulou's Department Store suffered a similar fate. She noted there were three or four breaks in sprinkler lines, and the water shot out the side of the building and caused considerable damage.

Ms. Phipps emphasized the importance of securing contents. She said workers in wineries, shoppers in grocery stores, and office workers at their desks are all vulnerable to damage, injury, or death. She showed a slide of overturned grocery shelves in a shopping aisle. Ms. Phipps pointed out that contents are not regulated by the building code and seldom require building permits, and she urged policy makers and local jurisdictions to think about the consequences of nonstructural damage and increase public awareness of this hazard. She repeated her previous recommendation to address the hazard from chimneys as well.

Commissioner Gardner said he was interested to hear about the research being done on the performance of retrofitted buildings, and he asked if there would be further study and analysis of these issues. Ms. Phipps explained that the first task was to get some data to identify buildings that are good candidates for further study, and that part has been accomplished. She said the process of obtaining drawings from the building department for each building of interest is underway, and she noted that Mr. Turner is involved in that effort. Once the drawings are available, she noted, FEMA is planning to fund further study.

Commissioner Gardner observed that many of California's cities have URM's that serve important functions, so it would be helpful to have information about which reinforcement techniques actually work in practice, as well as knowing why other techniques failed. He recommended ongoing Commission support of this effort.

Mr. McCarthy agreed with Ms. Phipps that chimneys have always been problems in earthquakes. He recalled hearing after the Loma Prieta earthquake that the average cost to rebuild a chimney is about $25,000, and he asked if Ms. Phipps knew the current costs. Ms. Phipps responded that she did not know the costs. She clarified that a URM chimney should not be rebuilt, so repairs would entail installing a framed shell with proper fire-rating and stucco covering. Mr. Turner estimated that this kind of repair would cost $15,000 to $20,000. Ms. Phipps pointed out that this would be a significant expense for many people and would be easy to defer.

Commissioner Miyamoto commented that Ms. Phipps had shown three examples of retrofitted building that performed well, and three examples of retrofitted buildings that performed poorly. He asked Ms. Phipps to estimate the ratio she actually observed in the field. Ms. Phipps said she was unable to answer that question yet, because some of the statistics from the red-tagging were very misleading. She noted that in looking at the number of red-tagged URM's that were strengthened versus unstrengthened, it was difficult to determine which buildings were red-tagged because of adjacency issues, and some were initially red-tagged and then changed to green. She added, however, that she believes the results will support the effectiveness of retrofitting.

Commissioner Hellweg observed that the only person killed in the Landers earthquake was also killed by a falling chimney. Ms. Phipps said the death in the Napa earthquake was the result of a falling television, again underscoring the importance of addressing contents.

Chairman Strack thanked Ms. Phipps for her presentation.

VIII. PUBLIC COMMENT

Chairman Strack asked public speakers to limit their remarks to three minutes. He welcomed people to submit additional information in writing to the staff.

Mr. Patrick Baker, wine grape grower, winemaker, and former general manager of some large and small local wineries, stated that he has seen the perils and damages caused by current barrel racking designs and stacking methods. He said the racking system allowed by OSHA regulations requires visual judgment and experienced precision with a forklift to balance curved racks on curved barrels. He noted this arrangement does not work well in a seismic event. Mr. Baker pointed out that a similar earthquake during the peak harvest season would have caused tremendous damage and harm to workers.

Mr. Baker advocated safer cellar operations and enhanced and updated labor and safety rules to protect employees and visitors to California wineries. He added that he represents a company that promotes a four-post rack-on-rack system that performed very well for one local winery where the system was installed.

Mr. Baker concluded by noting that falling barrels are an avoidable hazard, and current stacking methods do little to prevent barrels from falling during day-to-day operations and in a seismic event. He drew attention to the California Code of Regulations Title VIII, Section 3241(c), requiring that materials be stored in a manner that prevents tipping, falling, collapsing, rolling or spreading. He pointed out that the law does not address how high barrels are stacked, the manner of stacking, and their proximity to other barrels. Mr. Baker requested a full review of the current regulations.

Mr. Baker reported that he jointly started a new advisory council to the wine industry composed of industry representatives and experts. He said this new Cellar Safety Council is foremostly focused on safety of employees and guests, and the group will compile information and make recommendations for best safety practices in barrel cellars. He noted that the wine industry is unlikely to change its practices until regulatory bodies enforce safer practices, and he urged the Commission to work for reform.

Chairman Strack thanked Mr. Baker for his remarks and said the Commission will take note of his points and consider them for the future.

Mr. Jason King, director of a Bay Area construction company, said he was working to increase awareness of Standard Plan Set A, a document created by a number of professional engineering and building organizations and posted on the Association of Bay Area Governments' Website. He explained that Standard Plan Set A provides a map for retrofitting one- and two-story homes by connecting the wood structure to its foundation. He noted that houses retrofitted in compliance with Standard Plan Set A performed very well in the earthquake, while neighboring houses with cripple walls experienced substantial damage and were red-tagged. Mr. King advised that a typical retrofit using Standard Plan Set A costs less than $5,000.

Mr. King stated that Los Angeles adopted a mandate requiring compliance with a specific plan set, and he urged the Commission to work to extend that approach.

Chairman Strack thanked Mr. King for his remarks.

Ms. Sandina Bailo, owner, Sala Salon, thanked the Commission for providing this opportunity to speak. She noted that many of the previous speakers at this meeting provided statistics and data about the response and recovery period after the Napa earthquake, and she said she wanted to tell the story of one particular business.

Ms. Bailo said Sala Salon is a retail and service business in downtown Napa, occupying 2,500 square feet on the ground floor of a building constructed in 2008. She reported that the building did sustain considerable damage, but no one would have been killed if they had been in the building. She noted that major problem for her building was breakage of fire sprinkler pipes, causing significant water damage to the premises.

Ms. Bailo related her efforts to obtain prompt help immediately after the earthquake. She said emergency responders were generally busy with other urgent situations, so she walked to the building. She said she stopped at fire stations along the way to ask for help, and they seemed to have equipment available and ready to be deployed, but more than fire hours elapsed before the fire department arrived. She stated that when inspectors arrived later, they gave her a choice between a green tag and a yellow tag, and they explained the statistics were necessary for FEMA reports. Ms. Bailo said she chose green. She noted that when she hired contractors to work on the building, they were shocked that the building had been green-tagged, and had assumed a yellow or red based on the amount of earthquake and water damage.

Ms. Bailo said a FEMA inspector saw the sprinkler pipes after they were repaired and commented that they were still not strapped. She added that she did not know what the codes required, but she knew that if another similar earthquake happens, similar damage will occur.

Ms. Bailo stated that in order to keep her business running after the earthquake, she called Los Angeles and rented a mobile hair-styling trailer that was parked along the street. She said city officials challenged her right to park on the street, and the property was red-tagged within the next two hours. She noted that happened on a Friday, and after two television interviews and social media postings, the city contacted her on Monday and offered their help in finding a new place for the trailer. Ms. Bailo reported that she was able to open the trailer for business, but on a very limited basis.

Ms. Bailo observed that once the building became safe to occupy, after four weeks of retrofit work, her team was able to move back into the building. She said the earthquake has been a huge disaster for her business, and continues to be. She noted that after speaking with people from other municipalities, she wondered if the Napa Fire Department had any earthquake plan in place. She observed that emergency responders are generally well prepared for disasters, but not necessarily specifically for earthquakes.

Ms. Bailo expressed concern about the codes governing pipe strapping, and she urged the Commission to address this issue so this kind of catastrophe can be avoided by other businesses.

An unidentified individual showed images taken as the salon was flooding. He pointed out the mutual aid trucks that came from a number of neighboring counties, but stated that the record will show they were never actually deployed. He commented that it appears there was a breakdown in the command structure at the fire department in Napa in the aftermath of the earthquake. He said engines were sitting idle and undeployed as businesses were being damaged. He noted that business owners were told later that not all fire stations have the sprinkler keys for Napa businesses. He expressed his opinion that the Napa Fire Department should have made sure someone patrolled the business district and turned off sprinklers. He observed that many businesses in town experienced this kind of damage. He said over a dozen buildings were affected, including the salon, McCaulou's, and the county building. He blamed the lack of reaction from the Napa Fire Department for much of the damage.

Mr. Paul Ryan, Napa resident, commented that the earthquake early warning system is semi-theoretical at this point and expected to cost in excess $80 million. He pointed out that government estimates are notoriously low, and costs often exceed them by multiples of five or ten. He asked about the timeframe for deployment of a statewide early warning system.

Commissioner Mark Johnson explained that Senate Bill 135 instructed CalOES to identify funding sources for the system by January of 2016. He reported that CalOES has formulated a plan to describe the model, standards, management structure, outreach requirements, and funding sources. He said committees have been established to look at each area. He advised that by January of 2016, the group expects to have findings and recommendations, and subsequently, an implementation plan. Then, he noted, if funding can be identified, it will take time to install the hardware and establish a management structure.

Mr. Ryan observed that a reliable system is already available from a private company. He suggested it might be more efficient to use that than to try to develop a functional system that integrates a multitude of outside vendors. Commissioner Mark Johnson commented that the working group certainly has that option.

Chairman Strack thanked Mr. Ryan for his comments.

Mr. John Wilkinson, resident of Sonoma, reported that he experienced strong shaking from the Napa earthquake. He stated that he owns a small business in San Rafael and was hoping to learn whether there is an earthquake early warning system that works now. He said it sounds as though there are systems available. Mr. Wilkinson expressed concern about earlier references to blind spots in the warning system, and he asked for clarification of that point.

Chairman Strack said the Commission talks about earthquake early warning at virtually every meeting, so this meeting is only part of an ongoing focus.

Commissioner Mark Johnson clarified that there is no comprehensive system throughout the state yet, and until all gaps are filled, there are places where there are inadequate seismic instruments.

Commissioner Gardner said another kind of blind spot in the alert system is the lack of warning to sites on top of the earthquake fault, because there is no time to record an interval before shaking.

Dr. Allen clarified that the size of the blind zone is a choice based on how certain a user wants the information to be. He said the more stations that detect the earthquake and provide information, the more accurate the warning is.

Mr. Price stated that Seismic Warning Systems has no blind zone, and will publish data in the next few months showing that uncertainties have also been eliminated by technology. He said the company's technology solves the problem of providing a warning, with no blind zone, without a hugely dense network, and one that can still provide an accurate estimate of the earthquake.

Mr. Ron Lynn, chairman, Nevada Earthquake Safety Council, thanked the Commission for providing an opportunity to hear expert presentations and insightful comments. He expressed confidence that there eventually will be an earthquake early warning system. He expressed his appreciation to the State of California for vetting out all the unintended consequences so other states could make use of that information.

Mr. Lynn noted an earlier speaker asked about codes applicable to sprinkler strapping, and he offered to provide information about code requirements and standards to people who wanted to contact him later.

Chairman Strack thanked Mr. Lynn and his colleagues from Nevada for attending the meeting.

Mr. Joe Di Pasquale, Regroup, noted that Mayor Osby Davis had mentioned the need for multi-language emergency messaging, the service his company provides. He said Regroup has been working with the City of San Francisco and UC Berkeley researchers on a prototype system that issues emergency warnings in multiple languages. He stated that San Francisco is required to issue official notifications in English, Spanish, Chinese, and Tagalog. Mr. Di Pasquale explained that shake alert triggers issuance of warnings, and the warnings are generated automatically using a template for each language required.

Chairman Strack thanked Mr. Di Pasquale for his comments.

Commissioner Macari said he thought this was the most informative Commission meeting he had attended. He noted that all speakers were very good, and elected officials presented information on specific aspects of the response and recovery effort.

Commissioner Rabbitt suggested that the Commission consider developing a simple informational pamphlet for building owners explaining the meanings of green, yellow, and red tags, and offering resources and assistance. He proposed addressing the problem of chimneys, and he expressed interest in receiving more data about chimney vulnerabilities and remedies. Mr. Rabbitt reported that he observed damage to porches on bungalow-type homes that became disconnected from buildings, cripple wall failures, and damaged chimneys.

Commissioner Cooley commented that the story about the salon's devastation reminded him of the Roseville Galleria fire, where sprinklers also caused considerable damage.

Commissioner Hellweg said that in listening to the presentations, she was struck by the fact that California was lucky again with the timing of this earthquake in a relatively sparsely populated area in the early morning hours. She cautioned that there is still the potential for a much larger disaster, and people need to be prepared. In developing reports about this earthquake, she noted, the Commission needs to look at how it would have been different in a much larger region.

Chairman Strack observed that a parapet collapse on a Saturday night could have been far more disastrous.

IX. ADJOURN

Chairman Strack thanked all participants. There being no further business, the hearing was adjourned at 5:00 p.m.

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Sue Celli
Office Manager

Approved by:

_____
Richard McCarthy
Executive Director