

Summary Minutes

Nevada Earthquake Safety Council

6 August 2008

The Nevada Earthquake Safety Council (NESC) met from 9:30 a.m. to 4:05 p.m. at the Ohm Place office of Sierra Pacific Power Company in Reno. These and previous minutes are posted on the Web site for the committee (<http://www.nbmng.unr.edu/nesc/index.html>).

Ron Lynn chaired the meeting. Individuals attending the meeting are members of the Council:

John Anderson*, Nevada Seismological Laboratory

Scott Ball*, Engineering Geologist, MWH Americas, Inc., Las Vegas

Alan Bennett*, City of Reno

Mike Blakely*, Blakely, Johnson, and Ghusn

Geoffrey Blewitt, Nevada Bureau of Mines and Geology

Ian Buckle*, University of Nevada, Reno – Center for Civil Engineering Earthquake Research

Wayne Carlson*, Nevada Public Agency Insurance Pool

Juanita Cox

Craig dePolo, Nevada Bureau of Mines and Geology, who held the proxy for **Jim O'Donnell***,
Geophysical Contractor, Las Vegas

Diane dePolo, Nevada Seismological Laboratory, who held the proxy for **Steve Koenig***, Bellagio
Resorts

Greg Flanigan*, Farmers Insurance

Larry Garside, Nevada Bureau of Mines and Geology

Terri Garside, Nevada Bureau of Mines and Geology

Werner Hellmer, Clark County Department of Development Services, Building Department

Jenelle Hopkins*, Clark County School District, Las Vegas

Eric Hubbard, Kleinfelder

Bruce Hurley, U.S. Department of Energy

Luke Johnson, Fort Mojave Indian Tribe

John Louie, Nevada Seismological Laboratory

Ron Lynn*, Clark County Department of Development Services

Barbara Luke, UNLV Engineering, who held the proxy for **Wanda Taylor***, UNLV Department
of Geoscience

Jeff Lusk, FEMA Region IX (Oakland, California)

Rick Martin, Nevada Division of Emergency Management

Robert Martinez, Nevada Department of Conservation and Natural Resources

Greg Moss*, The Moss Group

Marcia Moss

Thurle Moss

Jon Price*, Nevada Bureau of Mines and Geology

Jim Reagan*, Sierra Pacific Power Company

Shawn Sellers, Fort Mojave Indian Tribe

Ken Smith, Nevada Seismological Laboratory

Ryan Turner*, American Red Cross

Jim Werle*, Converse Consultants

* indicates member of the Board of Directors.

A quorum of directors (the necessary 11) was present.

Board Members unable to attend or send a proxy included:

Bernie Anderson*, Nevada Assembly
 Warren Hardy*, Nevada State Senator
 Jim Walker*, Nevada Department of Transportation

The minutes of the 7 May 2008 meeting were unanimously approved.

Wells Rural Electric Video

Craig dePolo showed a video produced by Wells Rural Electric, about the Wells earthquake (magnitude 6.0 on 21 February 2008). The video ends with a request to donate to the Wells Earthquake Fund, c/o Nevada State Bank, P.O. Box 308, Wells, NV 89835.

Education and Awareness Committee

Diane dePolo reported that she and others attended the City of Reno Safety Expo (Tuesday, June 24th) and the Silver State Governor's Safety Conference (Wednesday, June 25th, through Friday, June 27th) on behalf of the NESC; she felt that the conference was not well attended, despite a wealth of training courses. Diane and others have given many talks to community groups (clubs, Boy Scouts, etc.) and tours of the Nevada Seismological Laboratory in the last several months.

Nevada Earthquake Awareness Week will be February 22-29, 2009. There will be a request that teachers have classroom earthquake drills. Information will go out at several intervals, beginning in January.

Ryan Turner offered to send Jenelle Hopkins earthquake-safety items from the American Red Cross.

Ron Lynn mentioned that Clark County may be able to help fund a calendar that includes safety issues (earthquakes as well as swimming pools and other concerns).

Jenelle mentioned an EarthScope Basin and Range workshop for education and outreach, October 19-22 in Reno. The focus will be on employees of parks and museums.

The Nevada Seismological Laboratory is having an information session for volunteers who hosted seismometers at their homes and businesses at 7:00 p.m. on Wednesday, August 13, in the third-floor theater of the Joe Crowley Student Union on the UNR campus.

Research Committee

John Louie invited interested individuals to attend a Community Velocity Model workshop on November 3 and 4 on the UNR campus. This will be a follow-up of a workshop in January 2008. If interested, please register on line at www.seismo.unr.edu/gbcvm. The overall goal is to build a community velocity model for ground-motion prediction at crustal, basin, and geotechnical scales.

Craig dePolo noted that the Nevada Bureau of Mines and Geology is taking the lead on a publication on the Wells Earthquake. The goal is for release by the anniversary date of the earthquake (February 21).

There is considerable ongoing research regarding the Mogul and Wells earthquakes.

Craig will be attending the EERI national workshop on earthquake scenarios in San Francisco.

Jim Werle noted that many people in Las Vegas (including Mayor Oscar Goodman) felt the magnitude 5.4 earthquake that occurred in late July in the Los Angeles area. Bruce Hurley noticed a sizeable lurch

in the two-story DOE building in Las Vegas. Greg Flanigan also felt it in a two-story building. Ryan Turner and Ron Lynn, who were in downtown Las Vegas, did not feel it. John Anderson will report on the seismic records for this event.

Policy Recommendation Committee

Wayne Carlson reported that the committee did not meet. He is working on a grant proposal regarding unreinforced masonry (URM) buildings.

Wayne noted that an article published in www.businessinsurance.com reports that FEMA is making a significant policy change to reduce repetitive loss to public entities (cities, counties, states, etc.). Jeff Lusk explained that Congress is requiring that FEMA develop policies for reducing repetitive losses.

Allstate Insurance Company has cancelled all earthquake coverage in Nevada.

Wayne noted that at its November annual meeting, the Nevada Association of Counties will hold a session on interactions between FEMA, the State Division of Emergency Management, and insurance companies.

Strategic Planning Committee

Jim Reagan submitted the NESC annual report of activities for 2007. It is appended to these minutes.

ACTION ITEM: Terri Garside will place adoption of the NESC annual report of activities for 2007 on the agenda for the November meeting.

Nominating Committee

ACTION ITEM: Rick Martin will work with the Nevada Association of Counties for a nomination to replace Marge Gunn, who has retired and resigned from the Council.

Ron Lynn has sent a certificate of appreciation to Marge for her service on the Council.

Ad-Hoc Committee on Department of Homeland Security

Jim Reagan reported that there will be a meeting on September 2 or 3 regarding Department of Homeland Security grants. Rick Martin suggested that NESC have representatives on appropriate subcommittees that make recommendations for project funding.

Ad-Hoc Committee on Anchoring of Propane Tanks

Werner Hellmer, Craig dePolo, and Alan Bennett will attend the upcoming meeting of the Nevada Board for the Regulation of Liquefied Petroleum Gas to discuss securing propane tanks in the event of an earthquake. Alan Bennett suggested that the Reno Fire Department may want to attend to express their concerns.

Division of Emergency Management Report

Rick Martin reported that the DEM has no year-end funding available, because Homeland Security cut management funds. However, if one of the counties reverts some of its funds this year, there will be funds available for funding projects approved previously by the Nevada Earthquake Safety Council.

The City of Wells received \$100,000 from Elko County and another \$300,000 in donations. The City put together a committee of clergy to help distribute the donations.

The Small Business Administration declared the event a disaster and gave some small-business loans (one for \$60,000).

The State's Individual Assistance Program (capped at \$28,500 per grant) provided five grants totaling about \$100,000. Two of the four homes destroyed in Wells have been repaired.

The City of Wells is applying for emergency assistance through DEM. Funds may come from two separate accounts, one of which requires legislative approval. DEM is working with the City to complete their applications.

Jeff Lusk noted that the State of Nevada did not request federal assistance; therefore FEMA did not deny funding for Wells. Rick Martin stated that the total amount of damage to public systems (on the order of \$790,000) did not meet the threshold for funding through the Stafford Act, given the population of Nevada, Wells, and Elko County.

Terri Garside noted that the Elko County Sheriff's Department has expressed their appreciation for Craig dePolo's compassion and care for the citizens of Wells.

DEM sent a damage assessment team to Wells immediately after the earthquake. Few people applied for Small Business Administration loans. DEM is working with FEMA and the Nevada Public Agency Insurance Pool on re-evaluating the damage and need for a Presidential Declaration.

Comparison Between Earthquake-Damaged Unreinforced Masonry Buildings (URMs) in Wells and Reno

Craig dePolo reported on lessons learned regarding URMs from the Wells earthquake. Major hazards were from debris falling from the URMs. In contrast, the insides of the URMs and adjacent buildings survived fairly well. These observations reinforce the point that the best action is to "duck, cover, and hold" rather than run outside.

Craig also showed photos of URMs in Reno, some of which have cracks in brick walls. He estimated that there are between 30 and 80 URMs in Reno. Most are moderately to well maintained. He emphasized that URMs continue to be a major challenge for earthquake mitigation. He suggested that one possible solution is to post "No Loitering" signs on the streets around the buildings. John Anderson noted that removing weight from attics and higher floors may help avoid collapse.

Hotel Owner's Guide to Handling Visitors During a Disaster

Craig mentioned that hundreds of people left Reno after the largest of the Mogul earthquakes. He proposes that the NESC update its guide for hotel owners (see www.nbmg.unr.edu/nesc). Ron Lynn suggested that NESC's guide be presented to the tourism industry as a draft for their input before final adoption by NESC. He noted that from experience at a fire emergency in Las Vegas, getting tourists the paperwork they need to return to their homes (passports, airline tickets, etc.) is a major hassle, as is dealing with over 100 foreign languages.

Jim Reagan suggested that the convention and visitors authorities should be engaged in review and distribution of the guide. Ron Lynn noted that the large hotels have pre-programmed announcements for various emergency situations (whether to evacuate, etc.). Ryan Turner noted that the American Red Cross opened many shelters after the Loma Prieta (World Series) earthquake.

ACTION ITEM: During upcoming NESC meetings, Craig dePolo will report on activities of an Ad Hoc Committee on Visitors, which Ron Lynn tasked to update the guide for hotel owners. Craig dePolo and Steve Koenig will be members of the committee.

Vigilant Guard After-Action Report

Diane dePolo noted that there will be an after-action meeting on Friday, August 14, in Carson City. The Nevada National Guard is compiling a report. Jon Price and Terri Garside reported on search-and-rescue exercises at the rubble pile constructed at the Washoe County EOC. Jon also participated in the initial press conference and in the Washoe County post-earthquake recovery exercise. Rick Martin mentioned frustrations in having to work the exercise without computers and other electronic equipment in their new EOC in Carson City.

GPS Monitoring of the Mogul Swarm, Evidence for Mainly Non-Seismic Fault Slip

Geoffrey Blewitt with the Nevada Bureau of Mines and Geology described global positioning system (GPS) monitoring in general, including semi-permanent stations in Nevada, and data collected before, during, and after the April 25, 2008 magnitude 4.7 Mogul earthquake. Four GPS stations installed near Mogul recorded the earthquake. Station RENO, located south of Mogul, recorded slip during the earthquake and even more aseismic slip after the earthquake. Station RNO1, located on a Washoe County library in northwest Reno, showed some pre-earthquake motion. Together with station VRDI in Verdi and a station at Mogul, the GPS data collectively indicate that slip after the earthquake was two to three times the displacement during the earthquake. Total displacement at the surface was about 40 mm, but only approximately 15 mm of this was due to the April 25 earthquake. There is no indication of deep crustal slip, based on the areal extent of the pattern of deformation. Vertical motions are very small. It appears that the geodetic motion has leveled off in recent weeks.

Seismicity of the Wells and Mogul-Somerset Earthquake Sequence

Ken Smith with the Nevada Seismological Laboratory reported that the Wells (magnitude 6.0, February 21, 2008) was on an east-dipping (55 to 60 degrees) normal fault. The initial epicenter location from the United States Geological Survey (USGS) backbone array of seismometers was 15 kilometers away from the actual location, which was determined by incorporating data from the National Science Foundation's (NSF) EarthScope instruments with data from the USGS's instruments. Unfortunately, NSF's EarthScope instruments will begin leaving Nevada this fall, as the array of seismometers is moved in a continent-wide, multi-year experiment. The Wells Rural Electric Company helped the Nevada Seismological Laboratory with deployment of portable instruments that were used to measure aftershocks. These stations were in place for two months; one has remained. With the aid of aftershock data, locations of all the earthquakes have been recalculated. The Nevada Seismological Laboratory estimates a radius of rupture of 4 km. The depth of the main shock was about 8 km, and aftershocks have occurred from 1 to 15 km. Deformation was measured at the surface using InSAR (about 14 mm of displacement). The stress drop from the earthquake was in the range of 56 to 86 bars (with slip of 55 to 83 cm). They have located about 1,300 aftershocks with instruments loaned to NSL by the USGS.

Ken then discussed the Mogul-Somerset sequence, which has included about 5,000 earthquakes. The fault solution for the main event and most of the foreshocks and aftershocks is right-lateral strike slip on a north-northwest striking, nearly vertical fault. Aftershocks were measured with 90 single-channel Texan portable instruments on loan from the Incorporated Research Institutes in Seismology (IRIS, of which UNR is a member). These allowed for locating earthquakes with more accurate hypocenters than those using only the network seismometers. Activity rates have declined substantially in the last two months; however, small earthquakes (~ magnitude 1) continue. Relocated earthquakes are mostly along a fault

zone that extends approximately 8 km along strike. Some other clusters have occurred off the main fault zone. All the earthquakes have been shallow, mostly within 5 km from the surface (with a few as deep as 10 km), in contrast to typical Basin and Range earthquakes with depths on the order of 10 to 15 km.

The IRIS instruments will allow better understanding of basin effects and local amplification.

Most of the information that Ken showed is available at the Nevada Seismological Laboratory's website (www.seismo.unr.edu).

Ken Smith also reported that a memorandum of understanding between UNR and UNLV is underway for seismic monitoring in the Las Vegas area.

Effects of the Mogul-Somersett Event and the Sequence

Craig dePolo showed photos and described effects of the Mogul sequence. The biggest emergency was the break of an irrigation ditch that diverted water into the Mogul neighborhood. The Truckee Meadows Water Authority quickly responded to the emergency by installing pumps to move water from the flume to another irrigation ditch. Several rocks fell into the irrigation ditch, keeping them from falling into houses. Otherwise, there would have been landslide-related damage to some homes.

Washoe County Emergency Management was given about 10 days of alert before the April 25 event (magnitude 4.7). Fire departments correctly moved many of their fire trucks and other emergency vehicles outside or were prepared to quickly remove doors that could be blocked by a major earthquake. Some of the worst damage included two houses for which bolts that attach walls to foundations broke during the earthquake. There was some cracking of plaster and seams.

People were under stress but motivated into action by the sustained exposure to the earthquakes, which began in late February and continued beyond the April 25 main shock. The Nevada Bureau of Mines and Geology distributed copies of *Living with Earthquakes in Nevada* (the booklet prepared with partial funding from FEMA through the Division of Emergency Management and NESC) to local residents before the main shock. Many people anchored water heaters to walls before the main shock, including the day of that earthquake, after two magnitude 4.0 foreshocks the day before. One house experienced damage from the main shock and from smaller aftershocks. There were two reports of breakage of gas lines. One house with damage was constructed with slabs of Styrofoam within a steel frame.

Rockery walls had mixed performance. Although most did not have cracks, there were a number of cases in which cracks formed inboard of the rockery walls. One crack was at least 100 feet long. Some other rockery walls had evidence of compaction behind the fronts of the walls.

There was much non-structural damage – broken mirrors and pictures, glassware that fell from cabinets, computers that fell to the floor, unsecured water heaters that moved, and loss of bricks from a few chimneys. Mitigation efforts worked; for example, rubber bands effectively kept cabinets closed, thereby reducing the potential damage from broken glassware and dishes.

Modified Mercalli Intensities reached VI in much of the Mogul area (and barely VII in some locations). There was no fault displacement at the surface. The area along a fault plane that ruptures during an earthquake is proportional to the magnitude. Earthquakes with magnitudes of less than 6.0 to 6.5 typically do not have surface ruptures of faults, but it was important to check for fault displacements at Mogul, because the main shock was shallower than the typical earthquakes in the Basin and Range province. See the Nevada Bureau of Mines and Geology website (www.nbmgs.unr.edu) for details on Craig's observations.

Craig estimates that nonstructural damage from the April 25 earthquake amounted to more than \$40,000 and that costs for clean up, slope stabilization, temporary pumping, and repair of the damaged irrigation system will be \$1 to 2 million.

Greg Flanigan noted that some insurance companies suspended selling earthquake insurance after the April 25th earthquake; others did not.

Ground Motion from the Mogul-Somerset Earthquakes

John Anderson, on behalf of the entire staff of the Nevada Seismological Laboratory, reported that peak accelerations were much higher than expected from an earthquake of the size of the main event (local magnitude, $M_L = 4.7$; moment magnitude, $M_W = 5.0$). The Laboratory measured ground motions of as much as 1.18 g (g is the acceleration due to gravity, 9.78 m/sec^2) during the April 25 event. Other instruments near the epicenter measured 0.85 g and 0.65 g. The measurements were made on temporary instruments that were deployed to the Mogul area before the main shock. The instruments were rechecked on July 28-29 to make sure that the measurements were accurate; the recalibrations were within 1% of the nominal settings by IRIS. Peak accelerations at more distant seismometers in the Reno area were close to or a bit lower than what would be expected, but the instruments near the Mogul epicenter measured values that were higher than two standard deviations above the expected accelerations, given the magnitude, location, and depth. Similarly, peak velocities were close to what would be expected for distant stations, but higher than two standard deviations above the expected velocities for the stations close to the epicenter. Peak velocity was about 54 cm/sec.

These ground motions are substantially higher than the current design standards in the International Building Code. Mike Blakely indicated that the houses would have been built to horizontal forces on the order of 0.25 to 0.3 g (0.13 g for earthquake codes, but more for wind shear). John emphasized that the small amount of damage in Mogul demonstrates the value of enforcing building codes. He noted that peak acceleration is not necessarily a good predictor of damage. The surprisingly large peak accelerations measured near the epicenter of this relatively shallow, small earthquake is a reminder that we still have a lot to learn. There is clearly much to be learned from deploying temporary instruments. Local residents greatly appreciated the presence of local experts with first-hand knowledge and up-to-date information.

John noted that the Mogul record is one of the top 25 accelerations recorded in the world up to that date. Had building codes allowed unreinforced mud-and-brick construction, as in Iran, where thousands of people died in 2003 from an earthquake with similar ground motions, there would likely have been significant damage in Mogul.

The strongest part of the shaking lasted only about 2 seconds, although shaking felt by people lasted for several more seconds. John noted that at his house, which was about 1 km west of the epicenter, he felt shaking for about 20 seconds, but there was a smaller felt earthquake 11 seconds before the main shock. The ground moved back and forth at Mogul by about 2.5 cm (one inch).

Fault solutions indicate that virtually all events in the Mogul sequence are consistent with right-lateral strike-slip motion on a steeply dipping north-northwest-striking fault zone.

Relocations moved the epicenters about 1 km east of their initial locations.

Jon Price noted that the Nevada Bureau of Mines and Geology plans to work with Washoe County and the USGS on updating detailed geologic maps in the Reno area. This will include some detailed mapping of faults in six 7.5-minute quadrangles in Nevada.

Report on Seismic Activity Since May 2008

John Anderson noted that although the frequency of earthquakes in the Mogul area has decreased, the sequence is definitely not over. Small earthquakes have not stopped. Very small earthquakes are no longer being recorded, because the temporary, portable Texan instruments have been returned to IRIS. Citizens throughout Nevada are encouraged to mitigate their homes for earthquakes.

The Chino Hills, California earthquake (magnitude 5.4, near Log Angeles) was recorded on seismometers in the Las Vegas area. The station on bedrock in Frenchman Mountain versus stations within the valley demonstrated significant amplification within the valley. Peak accelerations were about 2 cm sec^{-2} at a station near the DOE-Nevada Test Site office. The data will be useful in predicting ground motions from distant earthquakes located in different directions from Las Vegas. Previous good records were from earthquakes to the northwest; this earthquake was located to the southwest.

John noted that he was quoted in the Las Vegas Review Journal as stating that “the biggest fear . . . is that an earthquake of magnitude 7.5 or greater could occur in the Death Valley fault system in eastern California. He and other experts believe that could result in structural damage in Las Vegas.” Some people may interpret this as the worst-case scenario in Las Vegas, but an earthquake on the Frenchman Mountain fault in Las Vegas would cause more damage. Major earthquakes on the Death Valley fault system occur approximately once every 500 years, whereas major earthquakes occur on the Frenchman Mountain fault only once every few thousands or tens of thousands years.

ACTION ITEM: John Anderson will compare ground motions for different earthquakes in the Las Vegas area at the next NESC meeting.

Old Business

Ron Lynn reviewed action items from the previous NESC meeting.

John Anderson announced that Chris Poland is scheduled to give his lecture on building earthquake-resilient communities on September 17 in Reno.

Terri reported that there were 126 participants at Applied Technology Council rapid visual screening courses Reno (ATC 20 and FEMA 154) and 134 in Las Vegas.

Announcements

The next NESC meetings will be on

Wednesday, November 12, 2008 in Las Vegas at the Clark County Department of Development Services,

Tuesday, February 17, 2009 in Reno at Sierra Pacific Power Company (Nevada Power) on Neil Road,

Wednesday, May 20, 2009 in Las Vegas at the Clark County Department of Development Services,

Wednesday, August 26, 2009 in Reno at Sierra Pacific Power Company (Nevada Power) on Neil Road, and

Wednesday, November 4, 2009 in Las Vegas at the Clark County Department of Development Services.

Jeff Lusk announced that Johanna Fenton will be the new FEMA Region IX earthquake program manager. She will be introduced at the November NESC meeting.

Terri Garside noted that four cities in the US have been selected by FEMA for a Safe America Program to educate business owners on nonstructural mitigation. Reno is one (others are Emeryville, California and two in the New Madrid area). The local chamber of commerce will help coordinate the effort. The date

for a workshop involving local businesses will be October 16, 2008. The focus is on business continuity and recovery. NESC has been asked to help as needed.

Ron Lynn announced that WSSPC is soliciting nominations for its annual awards. See www.wsspc.org.

Public Comment Period

There were no additional comments.

The meeting adjourned at approximately 4:05 p.m.

REVIEW OF ACTION ITEMS

Terri Garside will place adoption of the NESC annual report of activities for 2007 on the agenda for the November meeting.

Rick Martin will work with the Nevada Association of Counties for a nomination to replace Marge Gunn, who has Marge Gunn has retired and resigned from the Council.

During upcoming NESC meetings, Craig dePolo will report on activities of an Ad Hoc Committee on Visitors, which Ron Lynn tasked to update the guide for hotel owners.

John Anderson will compare ground motions for different earthquakes in the Las Vegas area at the next NESC meeting.

respectfully submitted by Jon Price, 21 October 2008

Nevada Earthquake Safety Council
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NEVADA EARTHQUAKE SAFETY COUNCIL
Members of the Board of Directors and Officers
(as of 6 August 2008)

Business and Industry, Southern Nevada	Steve Koenig Bellagio Resorts
Business and Industry, Northern Nevada	vacant ***
Insurance Industry (statewide)	Greg Flanigan Farmers Insurance (Las Vegas)
State Government (statewide)	Jim Walker Nevada Department of Transportation
Local Government, City	Wayne Carlson Nevada Public Agency Insurance Pool (Carson City)
Local Government, County	vacant ***
Seismology (statewide)	John Anderson Nevada Seismological Laboratory (UNR)
Geosciences, Southern Nevada	Scott Ball MWH Americas, Inc. (Las Vegas)
Geosciences, Northern Nevada	Jonathan G. Price Nevada Bureau of Mines and Geology
Engineering, Southern Nevada	Jim Werle Converse Consultants (Las Vegas)
Engineering, Northern Nevada	Mike Blakely Structural Engineers Association of NV
Education (statewide)	Jenelle Hopkins Clark County School District, Las Vegas
Community Organizations, Southern Nevada	Ryan Turner American Red Cross
Community Organizations, Northern Nevada	Jim Reagan Sierra Pacific Power Company
University, Southern Nevada	Wanda Taylor UNLV Geoscience Department
University, Northern Nevada	Ian Buckle UNR Center for Civil Engineering Earthquake Research
Building Official, Southern Nevada	Ronald L. Lynn Clark County Department of Development Services
Building Official, Northern Nevada	Alan Bennett City of Reno
State Senate	Warren Hardy Nevada State Senator (Las Vegas)
State Assembly	Bernie Anderson Nevada State Assemblyman (Sparks)
Member at Large, Southern Nevada	Jim O'Donnell UNLV
Member at Large, Northern Nevada	Greg Moss The Moss Group

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Second Vice Chair-South

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Past Chair

Division of Emergency Management Representatives

Senior Deputy Attorney General, counsel for NESC

Ronald L. Lynn

vacant

Jim Reagan

Jim Werle

Greg Moss

Jonathan G. Price

John Anderson

Rick Martin

Glade A. Myler



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*Jon Price, Secretary
Terri Garside, NBMG Executive Secretary*

August 6, 2008

TO: Mr. Ron Lynn, Chairman, Nevada Earthquake Safety Council
Board of Directors, Nevada Earthquake Safety Council

FROM: B. Jim Reagan, Chairman, Strategic Planning Committee

RE: Annual Report of Activities for Plan Year 2007

I am pleased to provide a summary of activities and efforts achieved by the Standing Committees and members of the Nevada Earthquake Safety Council for the calendar year 2007. As with previous years, the committee members and members of the council have made great progress toward the mission and goals of the council and earthquake safety in Nevada. This year's accomplishments include:

EDUCATION COMMITTEE

- The committee is designing a Web site for education and awareness activities. This will include items on science, preparedness, school earthquake preparedness, the Nevada K-12 school seismic network, and Earthquake Awareness Week. Discussion on what should be included and what strategies should be used in the design included; links to the Incorporated Research Institutions for Seismology (IRIS), Nevada Seismological Laboratory, UNLV's earthquake awareness (earthquakes.unlv.edu), Nevada Bureau of Mines and Geology, the American Red Cross, FEMA, and Nevada Division of Emergency Management. Web sites, but there should also be content permanently on the NESC Web site. Items in Spanish will be particularly helpful, given Nevada demographics.
- Governor Gibbons has signed a proclamation setting Earthquake Awareness Week as February 25 to March 3, 2007.
- Calls from West Wendover came into UNR, asking whether an earthquake was recorded. With new data coming in from the NSF-supported EarthScope transportable array, the Nevada Seismological Laboratory was able to determine that whatever the event was, it wasn't an earthquake. The Laboratory is seeing a lot of previously unrecorded activity with these new instruments; many of these are mine blasts; others may be military activities.
- Various members of the Council have been contacted about an emergency preparedness calendar, to be prepared by a graduate student from UNR for Washoe County. With input from Council members, the County plans to focus on earthquakes in the month of February.
- Council members are involved in planning for the Nevada National Guard's week-long exercise (June 13-20, 2008), which will use an earthquake event. She has suggested several specific incidents to help make the exercise realistic.
- As part of the state mitigation plan, there are plans for getting Living with Earthquakes as newspaper supplements and to create a new earthquake website for the State.
- Southern Nevada is planning the TXO8 exercise (with an earthquake and unsuccessful terrorist attack) for sometime in 2008.
- There will be a tri-state legal exercise between Nevada, Idaho, and Utah in Reno in March of 2008.
- Ken Smith's course to train teachers about earthquake hazards and seismology was a resounding success again this summer.
- The Nevada Science Teachers Conference will be held in Las Vegas on February 8-9, 2008. Ken Smith was asked to speak at the conference about The Earth As a Classroom (TEAC) program, for which Ken is the lead instructor.

RESEARCH & INFORMATION COMMITTEE

- Southern Nevada seismic hazards conference will likely be delayed for one year and not be held this spring. The last such conference was in 1996, although some updates were made during the 2005 annual meeting of the Association of Environmental and Engineering Geologists in Las Vegas.
- Barbara Luke at UNLV is working on an Engineering Geology and Geotechnical Engineering Symposium, which could be linked to the seismic hazards conference. Kathy Snelson noted that the annual meeting of the Cordilleran Section of the Geological Society of America will be held in the new student union at UNLV in the spring of 2008, during UNLV's spring break..
- Craig dePolo volunteered to help others organize the symposium. John Anderson offered to propose to the USGS to help financially support travel and a proceedings volume.
- Craig dePolo noted that the report authored by him and Ron Hess, titled "Loss-Estimation Modeling of Earthquake Scenarios for Each County in Nevada Using HAZUS-MH" won a national award at the recent geographic information systems conference.
- The Committee reviewed the proposed new NEHRP maps. There is a 10 to 15% decrease in ground shaking for most of Nevada, primarily because of new attenuation relations (decrease in ground shaking with distance from the hypocenter of the earthquake).
- There will be a session on post-earthquake technical clearinghouses associated with the National Earthquake Conference on April 22-26, 2008 in Seattle.
- A new Nevada Quaternary fault map, to be published by the Nevada Bureau of Mines and Geology, is about to go out for review.
- The Nevada Quaternary Fault Working Group will be meeting November 19-20, 2007 in Reno, to evaluate 12 of the most hazardous faults in Nevada. Reports on each of these faults are posted on the Web at ftp://comstock.nbmg.unr.edu/pub/nevada_faults.
- Jim Werle noted that there a lot of linear construction projects (pipelines, roads, railroads, water lines, etc.) that may provide opportunities for detailed fault investigations. He also stated that Converse soon will have two faults exposed in trenches along Las Vegas Wash; he will contact Wanda Taylor and Burt Slemmons when the trenches are available for inspection.
- The UNLV Geoscience Department is hosting the joint meeting of the Cordilleran and Rocky Mountain Sections of the Geological Society of America on March 19 to 21, 2008 in Las Vegas. A symposium on southern Nevada seismic hazards, co-sponsored by the Association of Environmental and Engineering Geologists, is scheduled for March 20 as part of the conference. The abstract deadline is December 11; see www.geosociety.org for details on registration and abstract submission.

POLICY COMMITTEE

- The Council unanimously approved a motion to adopt the DRAFT Policy Recommendation Proposal Procedure presented by Wayne Carlson, with an amendment, to change the requirement that a request from policy recommendation review "must" be submitted to the chair of the Policy Recommendation Committee to "should" be submitted. The adopted procedure is appended below as NESC Policy Recommendation 2007-1.
- Wayne Carlson discussed earthquake-related bills in the 2007 Nevada Legislature. Assembly Bill 189 (sponsored by Assemblyman Anderson, to provide additional staff for UNR's efforts to reduce risks from natural hazards) did not pass. Assembly Bill 326 (sponsored by Assemblyman Mortensen, to make a list of unreinforced masonry buildings) did pass but was vetoed by the Governor, because it was felt that it would be an unfunded mandate for local jurisdictions.
- Wayne Carlson provided a status report on the committee's activities concerning unreinforced masonry (URM) buildings. He reported that the county assessors organization and urban assessors offices could provide a first-cut analysis using their existing databases, assuming a date of 1961 or after that (when the local jurisdiction adopted at least the 1961 model building codes); masonry buildings constructed prior to that adoption are likely unreinforced.
- In the joint meeting with Utah, Bob Carey stated that Utah uses 1974 as the cutoff date of construction for determining whether a building was URM. Using that date, they estimate that there are 180,000 URMs in Utah. Bob suggested that because schools are likely to be shelters during disasters, there may be opportunities for grants from the U.S. Department of Homeland Security for inventorying URMs. Ron

Lynn, Mike Blakely, and others noted that enforcement of building codes has not been consistent in Nevada.

- Dennis Nolan, State Public Works Board, volunteered that the Board's Facilities Conditions Analysis team can query its database of State buildings for pre-1961 masonry buildings, but the responsibility for buildings owned and managed by the Nevada Department of Transportation or the Nevada System of Higher Education rests with those agencies.

SCIENTIFIC AND INFORMATIONAL PRESENTATIONS

Top Earthquake Actions for Nevada

Craig dePolo and John Anderson led a discussion about a list of items that they prepared for NESC's consideration - items that are most important for the State of Nevada, Nevada citizens, public officials, and the NESC. They included actions that are achievable within a five-year timeframe and have the highest priority benefit for the State. There are no constraints on the number of recommendations; they came up with the following five.

1. Know your earthquake risk. We need a revitalization and dramatic enhancement in the number of Nevadans who know about earthquakes and how to be prepared for them. Awareness is needed for belief of reality. This should include preparation of disaster/emergency safety kits. The goal is to have emergency kits accessible to at least 50% of the Nevada population and tourists within 5 years.
2. Prepare for effective emergency response to an earthquake disaster. The goal should be to experience no deaths or extreme injuries due to poor emergency response to a disaster; the public expects this. Shore up shortcomings in emergency response now or make plans to make it right.
3. Make Nevada's buildings have a life-safety resistance during an earthquake. We need to inventory the most seismically dangerous buildings in Nevada. Develop a plan to retrofit or redesignate occupancy.
4. Plan to recover from an earthquake disaster. The state should come together to gather top experts at a well attended workshop to use this as a basis to prepare a plan to recover quickly from an earthquake disaster at a state, multiple county, county, major city, and rural level.
5. Plan for efficient tourist management and wellbeing during and following a disaster. There should be a Nevada Visitor's Disaster Response Plan. Make first contact with all hotel owners and the like and give them a one-page emergency-response flyer.

Award for Excellence

Ron Lynn presented the Nevada Earthquake Safety Council Award for Excellence to Gaye Coté in recognition for her efforts in earthquake awareness and preparedness for the Las Vegas Valley.

Update on the Joint Meeting with the Utah Seismic Safety Commission (USSC) and the NESC

Jon Price previewed the agenda for the 10 May 2007 meeting of NESC, which will be a joint meeting of NESC and the Utah Seismic Safety Commission in St. George, Utah.

Update on the Western States Seismic Policy Council in Reno

Craig dePolo described the draft agenda for the September 30 to October 2 joint annual meeting of the Western States Seismic Policy Council and the International Code Council in Reno. He has assembled an impressive set of speakers, most of whom are known nationally as experts in their disciplines.

Update on Earthquake Activity in Nevada

Ken Smith is visiting high schools throughout the state to discuss the use and impact of the USArray stations that are being deployed by NSF's EarthScope program. Earthquakes with much smaller magnitudes than could have been detected before the new stations were installed are now being recorded. The Nevada Seismological Laboratory is seeking support for converting as many of these stations as possible into the network operated by the Laboratory.

Nevada State Mitigation Plan – Earthquake Section

Craig dePolo discussed the latest draft earthquake section for the State Hazard Mitigation Plan. He modified the previous plan based on input from discussions at Council meetings during the last year and cast the action items in terms that the DEM can use in the overall Nevada plan.

There are 10 earthquake-related action items that resulted from this analysis.

1. Retrofit and mitigate shaking hazards in Nevada emergency facilities.
2. Create special planning consideration zones for Nevada communities.

3. Create a Nevada earthquake Internet site.
4. Insert "Living with Earthquakes in Nevada" into Nevada newspapers.
5. Teach Nevada teachers about earthquake safety in workshops, classes, and teaching curriculum.
6. Develop live and Internet-based workshops for professionals and citizens on building with seismic resistance, seismic retrofit methodologies, nonstructural hazard mitigation, and earthquake geology for geotechnical professionals.
7. Develop detailed earthquake disaster planning scenarios.
8. Identify and characterize earthquake hazards in Nevada, including microzonation and characterization of earthquake hazards in Nevada.
9. Inventory and retrofit seismically dangerous buildings.
10. Successful recovery from an earthquake disaster.

1914 Reno Earthquakes

Craig dePolo described the 1914 Reno earthquakes. On the basis of newspaper accounts of reports by people who felt the earthquake, the sources appeared to be directly under Reno (ground zero). There was a sequence of multiple earthquakes from the months of February through May. The main earthquake was two months into the sequence. There was a significant foreshock 28 hours before the largest event. There may have been two or three sources (locations on specific faults) of the earthquakes, because there was odd damage in Virginia City the day after the main shock in Reno. There was significant shaking in the Great Valley of California, which should be of concern to people there. The Nevada Bureau of Mines and Geology has posted the report on these earthquakes (Open-File Report 06-2), authored by Craig dePolo and Terri Garside, on its website (www.nbmng.unr.edu). Craig described two specific earthquakes. February 18, 10:16 a.m. (maximum intensity VI; estimated magnitude $5.8 + 0.3$). In Reno, this event broke windows, cracked walls, and threw bricks down from a fire wall at West and Second Streets and from a chimney on the UNR physics building. Strong shaking lasted for approximately 10 seconds. April 24, 12:34 a.m. (maximum intensity VIII, estimated magnitude $6.3 + 0.3$). It was felt from Winnemucca to Berkeley. Strong shaking lasted for approximately 15 seconds. In Reno, two chimneys came down on Lincoln Hall, and two chimneys came down on Manzanita Hall on the UNR campus. There was one block in Sacramento at which people ran out of their homes in their nightclothes. Interestingly, Mount Lassen in northeastern California erupted for the first time in many years on June 1, 1914. There is no reason to believe that the events are connected.

Update on Recent Earthquakes

Ken Smith provided an overview of seismicity in Nevada over the last two and a half years. He also updated the Council on the EarthScope USArray deployment in Nevada. The EarthScope set of 56 temporary, high-quality seismic stations is now operational in Nevada. They are spaced approximately 80 kilometers apart. Stations will stay in place for two years, but stations will begin to move to other states beginning January 2008. The EarthScope project is a major scientific experiment, funded by the National Science Foundation, designed to investigate the structure of the Earth in the United States. Although it is not designed primarily for earthquake detection, it has tremendous side benefits for earthquake monitoring in Nevada.

There is a significant increase in the quality of earthquake locations and capability to identify earthquake activity in areas in the state where literally no earthquake monitoring has been conducted. USArray provides high quality seismic waveform data, improved event locations, and improves that accuracy of real-time earthquake notifications for every area in the state.

The Nevada Seismological Laboratory (NSL) is seeking funding to keep stations in Nevada. In 2005, the NSL located 8,874 earthquakes (and some blasts for construction and mining). In 2006, they located 7,349 earthquakes (including some blasts from mining). To date in 2007, they have located 5,141 events. They are locating events in northeastern California, southeastern Oregon, and northeastern Nevada that would not have been recorded without the temporary EarthScope instruments. All the magnitude 4 or greater events since 2005 have been close to the California-Nevada border, north of approximately 37°30' North latitude.

On 8 March 2007, the NSL recorded a magnitude 4.85 earthquake northwest of Bridgeport, California, and south of Wellington, Nevada. The NSL created a ShakeMap of this event. There was a magnitude 3.8 earthquake on 27 April 2007 near Alamo. The northeast-trending Paranagut shear zone in the Alamo area has had frequent magnitude 3 earthquakes since the NSL began to record earthquakes.

Ad-Hoc Committee on Anchoring of Propane Tanks

Werner Hellmer, chair of the ad-hoc committee, stated that the current International Building Code does not contain requirements for anchoring propane tanks. For horizontal installations, there are no direct requirements for anchoring the tanks, although there are requirements regarding foundations for these tanks. He noted that the Nevada Propane Gas Board, which regulates these tanks but does not currently require anchoring, would welcome comments from the NESC. Werner noted that FEMA does have recommendations regarding this issue, but FEMA does not provide specific recommendations on how to anchor the tanks to their foundations or the ground. Alan Bennett noted that the manufacturers of the tanks have recommendations for supporting the tanks. Mike Blakely advised that all tanks with flammable materials be secured to resist earthquake forces.

Update from the Nevada Seismological Laboratory

John Louie reported that the Nevada Seismological Laboratory will be generating about a dozen ground-motion scenarios for the Reno-Carson City area.

The Nevada Seismological Laboratory is hosting a Nevada Great Basin Community Velocity Model Workshop January 14-15, 2008 in the new Joe Crowley Union on the UNR campus. Details are available at <http://www.seismo.unr.edu/gbcvm/>.

Special Thanks to Burt Slemmons

Ron Lynn presented Burt Slemmons with a plaque in thanks for his service to the Council and to earthquake science and risk reduction in Nevada. The inscription on the plaque reads: "In recognition of being one of the foremost earthquake science pioneers in Nevada and for being a charter member in the Nevada Earthquake Safety Council, with 16 years of dedicated service and advice. You serve as a role model, for professionals and students alike, on how to have passion and enthusiasm in everyday work, in high-caliber science, and in advocating public safety. We'll miss both your "can do" personality and your sage advice. Thank you Burt!"

Voting on the Proposals Received for Possible Year-End Funding

The NESC reviewed seven proposals, including one from the Awareness and Education Committee and six from the Research Committee. The motion passed unanimously (with one abstention) to endorse all the proposals and approve the following list by priority (#1 = highest; #7 = lowest).

1. Creating the nvquakes.info Earthquake Super Site (\$15,000 in DHS/FEMA/DEM funds; \$30,000 total)
2. Workshop on Liquefaction Assessment in Nevada (\$12,691 in DHS/FEMA/DEM funds; \$25,382 total)
3. 1915 Pleasant Valley Earthquake: Description and Intensity (\$22,180 in DHS/FEMA/DEM funds; \$44,360 total)
4. Earthquake Preparedness Communication Techniques (\$41,744 in DHS/FEMA/DEM funds; \$85,488 total)
5. Site Conditions at Reno Buildings Damaged and Undamaged in 1914 (\$5,000 in DHS/FEMA/DEM funds; \$10,000 total)
6. 1933 Wabuska Earthquake: Description and Intensity (\$20,488 in DHS/FEMA/DEM funds; \$40,976 total)
7. Establishing a Strong-Motion Station over Reno's Deep Basin (\$15,000 in DHS/FEMA/DEM funds; \$30,000 total)

Discussion of Future Summit on Disasters in Rural Communities

Craig dePolo led a discussion on what would be included in a summit on disasters in rural communities. Items discussed included: holding the summit in Elko, Nevada; having a half-day field trip focused on impacts of a scenario earthquake near Elko; defining what is meant by rural areas, small towns, and frontier areas; discussing the rural setting from sociological, building, and response perspectives; building codes and enforcement; non-structural hazards on ranches and farms; law enforcement issues that are unique to rural areas; disaster declarations and federal and state responses to rural disasters; meeting the match requirements for FEMA grants; issues of staffing for dealing with assistance from the federal government; volunteer efforts (law enforcement,

fire response, etc.; costs of training); unique and irregular building structures; and what NESC and others can do to assist rural communities with preparedness, mitigation, response, and recovery.

Joint Meeting of Nevada Earthquake Safety Council and Utah Seismic Safety Commission

The complete minutes will be attached for review. Because of this unique opportunity for both commissions, it is important to provide all information from this meeting unedited.

In summary, the Nevada Earthquake Safety Council has provided a successful venue for science, research, and information on Nevada's Earthquake Hazards to be promulgated in legislature, provided to business and industry, and delivered to the citizens of Nevada. Additional information and details of these accomplishments are noted in the minutes of the quarterly meetings. The many contributors to this outstanding effort are recognized in the minutes, and it is important to note that it does indeed take many contributors, individually and in concert with one or more committees, to achieve the goal of Earthquake Safety in Nevada.