Utah Seismic Safety Commission
Quarterly Meeting Minutes

On January 18, 2018, a regularly scheduled quarterly meeting of the Utah Seismic Safety Commission (USSC) was held in the Kletting Room of the Utah Senate Building in Salt Lake City, Utah. Chair Leon Berrett called the meeting to order at 9:00 a.m.

Members Present:

Leon Berrett, Chair	American Public Works Association
Rick Allis, Vice Chair	Utah Geological Survey
Keith Koper, Vice Chair	University of Utah Seismograph Stations
Roger Evans	Utah League of Cities and Towns
Patrick Tomasino	Utah Division of Facilities and Construction Management
Steven Bruemmer	American Institute of Architects, Utah Disaster Assistance
Meldee Love	Utah Insurance Department
Craig Kerkman	Association of Continuity Professionals
Gerald McKenzie	Structural Engineers Association of Utah
Bob Carey (designee for Kris Hamlet)	Utah Division of Emergency Management

USSC Staff Present:

Steve Bowman	Utah Geological Survey
Adam Hiscock	Utah Geological Survey
John Crofts	Utah Division of Emergency Management
Emily Kleber	Utah Geological Survey

Guests Present:

Glen Palmer	Palmer Engineering

Members Not Present:

Evan Curtis	Utah Governor's Office
Representative Gage Froerer	Utah House of Representatives
Chris DuRoss	U.S. Geological Survey (Ex-Officio)
Senator Jerry Stevenson	Utah State Senate
Peter McDonough	American Society of Civil Engineers
Joaquin Mixco	Utah Department of Transportation

Welcome and Introduction of Members and Visitors/Approval of Minutes

Leon Berrett made introductions, recognized guests, and presented the minutes from the previous meeting.
Bob Carey (designee for Kris Hamlet) made a motion for approval of the November 8, 2017 meeting minutes.
Keith Koper seconded the motion. The minutes were unanimously approved.
Leon thanked the Nevada Earthquake Safety Council (NESC) for preparing the minutes.

Utah Geological Survey (UGS) Levan and Fayette Segments, Wasatch Fault Zone (WFZ) Paleoseismic Investigation and WFZ Mapping Project Update – Adam Hiscock

Adam Hiscock discussed NEHRP funded work which began October 2017. The UGS opened two trenches on the Levan and Fayette segments of the Wasatch fault. Adam discussed that these are the two southernmost segments of the WFZ and that this is the first investigation to occur on the Fayette segment. Two sites were selected, one on the Levan segment and one on the Fayette segment. Adam utilized a drone to capture photos of the sites and demonstrated aerial views of the open trenches. He provided a detailed description of the fault investigation and discussed the data that will result.

The investigation provided evidence for two earthquakes occurring at the Levan segment site, and one earthquake at the Fayette segment site. The discoveries were in line with what they were expecting. The trench investigation was completed in November and they are still in the process of completing the analysis. The investigation is significant because it represents the first time the southern segments have been studied and will provide earthquake rupture and timing data for this part of Utah. He recognized the people that helped with the project.

The question was asked of how locations for trench investigations are determined. He explained that they choose a location that has not been disturbed by human activity and shows good evidence for young fault rupture.

Keith Koper said he thinks it is great that we are performing this investigation and happy they are carrying on. He commented on the possibility of telling if one earthquake ruptured across multiple segments.
Adam said that was one of their primary research questions for this study and additionally, Chris DuRoss (U.S. Geological Survey) is looking at the same research topics. Once the analysis is completed, they should be able to determine if earthquakes from other segments ruptured these sites. The southern segment boundary is a very young and they are researching this segment's interaction with the other segments.
Keith asked if they would do this research without National Earthquake Hazards Reduction Program (NEHRP) funding.
Adam explained that they are continuing to submit for more funding. He hopes they can receive funding for a Clarkston Mountain segment fault investigation. He also discussed fault scarps near Mona, Utah and discussed the hope for further investigation at that site. Adam explained that they are conducting detailed fault mapping for 30 quadrangles in Utah and Idaho and the final data will be available on their website. This information can be used by community planners and others. This fault mapping was mostly completed using recently acquired, high-resolution Light Detection and Ranging (lidar) data. These data help delineate and identify faults and allow mapping of faults in much greater detail. Adam demonstrated the data and several examples from this mapping project.
Adam and Steve mentioned the Utah Earthquake Working Group meetings to be held February 12th through the 14th. Everyone is invited to attend, and the meetings are in the Utah Department of Natural Resources Auditorium. They will be dealing with Utah earthquake issues and Great Basin state earthquake issues.

2018 State of Utah/UGS Lidar Elevation Data Acquisition Update—Steve Bowman

Steve discussed some of the efforts to create maps and some of the hazard planning. Question about target areas, if we have a **M** 7.0 earthquake, are there areas we have pre-identified where we would rebuild or not, and if there is a rupture in this area where our first response might be? Discussion continued about earthquakes, landslides, and development that could be affected. He provided an update on Utah lidar elevation data acquisitions and ongoing efforts.

Review of the 8th International Workshop on Paleoseismology, Active Tectonics, and Archeoseismology, New Zealand—Emily Kleber

Emily Kleber recently had the opportunity to go to New Zealand to attend a Paleoseismology Workshop and Conference (PATA days – Paleoseismology Active Tectonics and Archaeoseismology, November 13-6, 2017). This workshop discussed the effects of the 2016 magnitude 7.8 Kaikoura earthquake in New Zealand, examined surface fault rupture, and consisted of two field trips and a public lecture. Christchurch is the largest city on South Island. Discussion started on New Zealand geography and infrastructure and the effects of the earthquake, including tectonics, specific New Zealand faults, and the plate boundaries, along with some of the similarities with Utah.

Discussion continued on how the Kaikoura earthquake occurred, the large fault system, and compared/contrasted with Utah. Very important we learn about complex surface fault ruptures. Strong motion effects felt in most of New Zealand. Discussed map of earthquake fault ruptures. Kaikoura earthquake had two minutes of ground shaking that propagated to the north at 2 km per second. After seeing features in the field, it was evidently a very complex surface rupture. One of the other major effects was the 200 large, valley-blocking landslides. The biggest effect of the landsides was on infrastructure and the main highway (Highway 1) along the east coast. A freeway full of trucks and goods was effectively taken out. **Leon** clarified a description about the photos.

Emily described their damaged infrastructure, including Highway 1 (similar to our Interstate 15) that was significantly interrupted. The day the after earthquake, basically everything was shut down, including ferries for a few days to weeks. Over 100 days after the event, Highway 1 was finally opened in December 2017. They were required to do significant improvements because of the earthquake damage. She discussed the improvements—stabilized landslides and rockfalls along the highway. They had done unconventional things, like set explosives to clear the roads. She descripted fault ruptures that they toured on the field trip. She discussed a lidar image that shows the faults going across rivers and infrastructure. The presentation demonstrated a photo of a fault that moved directly beneath a cottage, showing fault movement and significant damage. The Commission held a discussion about the possible survival of the resident being thrown out of home. Understanding these ruptures are important to see how scarps occur and how they erode over time. She described a very large landslide that cut a major transportation link. Something else to think about is the effects on people after the earthquake and some of the efforts that were made to help the residents. Scientists need to be sensitive to residents and properly explain why scientists are there. Discussed importance of accurate data after an earthquake and public trust. Discussed authentic collaboration with communities. Being available to communities is valuable,

such as the Christchurch earthquake sequence and the cogitative effects. First in Darfield, but then set off aftershocks in Christchurch. Magnitude 5 earthquakes were happening every week for two years. Still a lot of work to do to rebuild Christchurch. A lot of people left the city. Everywhere, there is a parking lot now, where there used to be a building. They are an advanced nation and they still have a lot of work to do.

Keith asked if there was a sense with students if more people want to grow up to be seismologists and engineers.
Emily said that all the residents seem to have a pretty good understanding of geology. They are a rapidly growing country and they are very conscious of earthquakes. Discussion of mapping technologies over time compared to Utah, which has not experienced major earthquakes since pioneer settlement. There are pre-earthquake lidar data already for the Wasatch fault zone and a lot of historical aerial photographs. In terms of pre-earthquake data, we have pretty good data. For recent earthquakes like Napa, they had planes in the air quickly to collect post-earthquake lidar data. In Japan, they are great at getting planes in the air quickly to collect post-earthquake lidar data. Getting planes in the air quickly is important to collect this data. Maybe Utah could write a scenario of how quickly we could collect lidar data after an earthquake that has surface rupture.
Rick Allis said emergency management was involved and that we have interactive data to look back on what has occurred since 1935. Second, in the urban areas there is a redevelopment exercise to develop closer to faults.
Leon asked when she was there, and she informed him it was in November (their spring).
Adam said they have a good relationship with third parties to investigate across the fault in Salt Lake County, Salt Lake City, and Sandy when looking at development and there are certain requirements.
Steve said many of the reports are online (https://geodata.geology.utah.gov).
Emily added that right now we talk to cities, developers, and others and try to communicate with them.

Review of the USSC/NESC November 9, 2017 Joint Meeting

Leon referenced the meeting minutes and discussed the joint USSC/NESC meeting and talked about seismic improvements of Lincoln Hall on the University of Nevada, Reno campus.
Bob gave an update on the Fix the Bricks program.
Barry Welliver talked about the seismic risk of non-ductile concrete.
Leon discussed the Commission's strong letter of support to the Utah Division of Emergency Management (UDEM) as the lead for the resiliency plan.
A joint **USSC/NESC** statement that unreinforced masonry buildings (URM) remain the most common killer in earthquakes and restated the need to reduce the number of URMs. **Leon** talked about NEHRP and the support they are trying to get through the program.
Steve gave a report on the UGS *Utah Earthquakes and Quaternary Fault Map*.
Rick said that it is worthwhile touching base with Nevada for support.
Bob agreed with Rick that our Commission is more than a council. Because we are a commission, there is more weight behind our messaging and being a commission gives us more credibility than a council.

Keith agreed that it was valuable and thinks Nevada should be willing to come to Utah as well. He suggested them coming to Utah maybe once every four years.
Bob suggested maybe we could go to Elko or perhaps even St. George. He said the number of people would drop off significantly if we had it in Salt Lake City. He said this was the best attended meeting by the Commission. The Commission agreed that we should continue to work jointly with Nevada in case an earthquake should occur, and we require each other's assistance.
Leon said we should continue to hold joint meetings every other year.
Leon deferred to Bob to discuss a possible URM summit and rural earthquake conference.
Bob said that because of the Fix the Bricks program, Nevada has proposed a URM summit to be held sometime in 2019 in Reno.
Leon asked how the Commission feels about the summit.
Bob said most of rural communities have URMs and this is the broader audience. He indicated that the summit was in preliminary discussions and details have not flushed out. Also, under consideration for the summit would be non-ductile concrete structures.
Leon said that the Commission supports the summit concept, and UDEM will take up further discussions with Nevada.
Bob suggested having this in September 2019 (after Labor Day).
Leon suggested maybe talking to other organizations to sponsor the program such as the Structural Engineers Association of Utah (SEAU), Earthquake Engineering Research Institute (EERI), and the American Planners Association.
Steve Bremmer discussed the benefits of involving others in this conference and it could be a discussion to strengthen current code. There are several issues that could be discussed by Dr. Lucy Jones (U.S. Geological Survey, retired) at this conference and she could help develop a better dialog of presenting to politicians and others.
Bob said Dr. Jones had disregarded developers in these discussions. Dr. Jones said developers were never going to come to the table. It was a process of getting building managers, infrastructure owners, and others on board first, and having developers come after the decisions were made. Once decisions were made, then the developers agree to participate.
Gerald McKenzie would be willing to sit down and be a liaison between SEAU and the conference committee.
Discussion took place on sharing this with SEAU, the Utah League of Cities and Towns, and others to explore topics to discuss.
Rick said there are enough topics to even make this conference a two-day conference. If we do it for two days, it may justify Utah, Nevada, Idaho, and others to come to the conference for a couple of days and have flexibility to come one or two days.
Bob said there is a possibility of including the Western States Seismic Policy Council in the planning and involve issues, such as schools. A rural earthquake conference is entirely different from a metropolitan one, as the small communities deal with limited resources.
Rick said the challenge is who you are holding the conference for and the audience.
Bob said you want more participation from other states and you need to cover a variety of issues.
Leon asked if we had consensus from the Commission for looking into this. The Commission agreed that they would like to investigate this further. Consensus was that we would proceed.
Bob agreed to discuss with Craig dePolo and discuss this at the next Commission meeting.
Steve brought up that an item we missed earlier that the State of Utah had conducted lidar acquisition that will be discussed at the upcoming UGS Utah Earthquake Working Group meetings, and that they will have an agenda ready soon.

Leon asked to have Steve email Commissioners the details.
Steve said that lidar funding would be provided and that information would be ready around spring/summer of this year.

Legislative Update and USSC Presentation to the Legislative Audit Committee— Evan Curtis/Leon Berrett

Leon discussed the Legislative Audit Committee review of the Commission. The Committee wanted a brief overview. Leon said a third of the audience left and with limited Committee participation, Leon gave his presentation. He shared with the Committee, the Commission's website that included information about earthquake safety and other information on the site. He received no negative comments from his presentation. One question asked was: What is the need of the USSC?
Bob said the question was about relevance. If you were not a Commission, then what would happen?
Discussion took place about the importance of the Commission and discussion of how legislation has occurred and how the Commission assists with valuable programs.
Leon said that the Commission's strength comes from the variety of subject matter experts that the Commission brings together. The Commission is the hub for discussions related to seismic safety.
Evan Curtis provided an update on legislative messages. Evan said it is a standard question to ask people why they are relevant. This is another record year and there is not enough time for staff to write all the bills and many bills will not be released. This year, education and taxes were big issues. A lot of talk over transportation and land use. Big issues will also be to move the prison, energy efficiency, and air quality. There is over $30 million for the agricultural budget. The Commissioner of Agriculture is pushing to have this budget completed. There are a couple of box car bills. Senators May and Hutchings have bills that may have seismic issues and we will have to watch those. There is a bill regarding water jurisdictions and another bill would prohibit any governmental entity from lobbying for federal land designation, unless they first get approved by the Legislature.
Bob asked about codifying placarding and that there is no law permitting us to placard buildings or no penalty for the removal of placards. If we pass it on a state level, then there will not be variation from city to city.
Leon said that we should discuss this further in the future.
Rick discussed the 10-20 second speech that each of the Commissioners should be prepared to discuss if approached by a legislator or media representative. Each Commissioner should be prepared to say something valuable. For instance, if the media asks: What can we do? Say we can "fix all our schools to be seismically safe," a short, understandable, concise, and powerful statement.
Leon said all of us on the Commission should be able to defend why the Commission exists.

Review of Earthquakes in 2017—Keith Koper

Keith presented a PowerPoint presentation regarding NEHRP as the umbrella for the USGS, Federal Emergency Management Agency, and others. He explained that work that Adam presented was partially funded by NEHRP. The University of Utah, UDEM, and others get

funding from NEHRP and it is a vital funding source for so many seismically-related projects and programs. There is currently an effort to reauthorize the program. The bill was introduced in September 2017. What has happened more recently is that there was buy-in from Republicans and that it did pass a House committee and would likely pass through to the full Senate. The original reauthorization bill had no funding attached to it. It is a good sign that it was bipartisan; however, the language is still being discussed. Keith's counterpart from Alaska is testifying before Congress. This bill also has language on Earthquake Early Warning systems. Congress is indicating they do want to put in funding for Early Warning. He said maybe Utah could get funding for Earthquake Early Warning perhaps four to 10 years from now. The bill has not been approved, but it did make it out of the Senate Committee which is a very good indication.
His colleagues and others supported NEHRP. He explained that they could not get our Utah Senators to support the bill; however, they did get some call-backs from Senator Lee's office. He discussed the process for looking at the actual bill and that you could look at the bill and amendments online.

Overview of 2017 Earthquakes

Keith said there were exactly 1000 earthquakes in Utah in 2017. He showed the earthquakes occurring in Utah on a map and discussed mining-induced earthquakes. Because of the decline of coal mining in Utah, there are fewer mining-induced earthquakes. The U.S. Bureau of Reclamation has their own, small seismic network that measures earthquakes. He said the largest, U.S. mining-induced earthquake was a **M** 5.7 in Oklahoma. These earthquakes are a real hazard. Induced seismicity is now recognized by the USGS and are releasing seismic hazard maps every year. In 2017, this is a typical seismicity year for us. He discussed small earthquakes < **M** 3.0. A **M** 2 or **M** 1 are not typically felt. There are typically 10 to 20 earthquakes a year that are felt. Typically, Utah has two or three earthquakes a day. The largest earthquake was near Park City earthquake that was felt in Salt Lake City as well. It was the same week as the Mexico and the North Korea **M** 6.3 earthquake. It did not cause damage, but there were many questions. Two large seismic events were not in Utah, but nearby. In southwestern Idaho, the main shock was **M** 5.3 which was felt in Utah and over 1000 earthquakes have occurred in this swarm. The other big swarm was in Yellowstone and there were 20,000 earthquakes associated with it. We had a lot of media inquiries about that.
Keith discussed the magnitudes of earthquakes and explained the differences between a M3 and M4 and the differences of energy release. He discussed that if we had a **M** 6 in Salt Lake City, it would be devastating. He compared the Christchurch earthquake to a similar Salt Lake City earthquake and the resulting damage. He discussed the UGS trenches in Utah and the magnitude of the earthquakes that the investigations revealed.
Rick asked about the frequency of earthquakes. The way seismologists say is that we are 10 months pregnant and overdue for an earthquake. In 1992, we had the last **M** 5+ earthquake in Utah. He discussed the release of the *Earthquake Probabilities for the Wasatch Front Region in Utah, Idaho, and Wyoming* report (https://ussc.utah.gov/pages/help.php?section=Utah+Earthquake+Probabilities) and there is a probability of 57% of a **M** 6 or greater earthquake in the next 50 years. For younger generations, today there are better odds for a damaging earthquake along the urban corridor in their lifetime. He talked about our soundbites we could get out about the new probabilities. The largest earthquake in 2017 was **M** 3.8.

Adam mentioned that there are differences in geology across geographic areas across Utah.
Keith discussed geographic differences in Utah and different, such as a **M** 5.3 earthquake in the San Rafael Swell area.
Leon thanked Keith and turned time to Bob.
Bob discussed the upcoming Clearinghouse Workshop. EERI approached Bob and Steve regarding a clearinghouse workshop. EERI has the opinion that most states do not have any kind of clearinghouse capability. EERI wanted to demonstrate one of their collection application tools that helps collect field data. After the last phone call, we made them aware that ever since the Northridge, California earthquake, the State of Utah had a clearinghouse website to help with the collection of field data. He discussed a tentative date of April 16th for the workshop that will be held at the UGS. His perspective that we would like to familiarize people on what would happen if we have an earthquake. There are volumes of data that may go uncollected and that is the challenge. Therefore, the clearinghouse was created. The morning session of the clearinghouse workshop will be looking at the EERI data collection tool. The afternoon session will consist of a series of short presentations and finish with a panel discussion. We want EERI to come here with a collaborative viewpoint. He discussed Steve's opinion to have an exchange of data, because not everyone will be able to get to every notable geologic and structural location. He wants to have a broader view of sharing data. The Utah clearinghouse allows us to house the field data, oversee it, and allow other people throughout the country to view it. He said an excellent agenda with speakers is shaping up and we will have a local slant with people like Bryan Romney from the University of Utah.

School RVS Study and Other Updates

Bob mentioned that Jenefer Youngfield has retired and we have had a discussion with her replacement. Reaveley Engineering is not only going to provide data collected from this study, but also data that they have collected on schools from other contracts and incorporate that into a final report. Evan along with his subcommittee hope to get the completed report by June and that the Commission may see it soon after. He said it was a $150,000 contract and that he assumed the Governor would like to see this completed. He discussed the details of the study. Low probability of seismicity areas was left for last. Bob and Barry are going out and completing the RVS studies for these low probability schools.
Keith asked about elementary schools being the most dangerous.
Bob said the high schools are being retrofitted because there is a better cost benefit return. He also referenced Dr. Jones who said there is a 10% failure rate for new buildings.
Leon asked John Crofts for a progress report update.
John discussed receiving the submitted narratives from the Commissioners and said we would be revisiting the would be revisiting the report when time allows.
Bob discussed receiving his supplemental NEHRP funding and spoke to the different projects that the funding was going to support.
Leon talked about creating a pamphlet. He will have a draft as pamphlet for the next meeting. He will send out a draft to the Commissioners.
Bob talked about the Tornado Summit and how it has emergency management, earthquake, and building design elements. Bob discussed the value of the conference and the all hazards approach. He discussed insurance companies getting more involved in construction projects from the beginning. He discussed the Oklahoma law requiring that houses needed to be fastened to

their foundations and metal ties tying brick veneers to the structure. He said it is an excellent conference in Oklahoma City. He discussed insurance and reinsurance and how it will be more involved in construction. He believes insurance companies will be more involved in the future and have and increase premiums based on risk.
Meldee Love said that there is a difference between tornado and earthquake insurance and that this is a piece of education. If you do not pay for it now, you will pay for it later.
Leon said there was a joint exercise with the Utah Department of Transportation regarding debris removal. He discussed a joint probably be a couple weeks after the Great Utah Shakeout.

Next Meeting

The next meeting is tentatively scheduled for April 26, 2018, in the Kletting Room at the State Capital Senate Building. Details will follow.

Adjourn