

Colorado Earthquake Hazard Mitigation Council

The ad hoc Colorado Earthquake Hazard Mitigation Council continues to meet bi-monthly on the campus of the Colorado School of Mines.

The CEHMC policy recommendation on seismic design of public schools that was originally submitted to Colorado Geological Survey in 2008 is consistent with the WSSPC Policy Recommendation for Seismic Design of New Schools. The CEHMC recommendation was resubmitted on January 3, 2011 to the State of Colorado, Colorado Division of Fire Safety, and again on November 1, 2012 to the Division of Fire Prevention and Control, for their use in issuing building permit applications for the construction of public schools. However, the recommendation has not yet been implemented by the State of Colorado.

Seismic activity has continued west of Trinidad in southern Colorado. The Colorado Geological Survey 2002 “Rocktalk” publication stated that “the detailed studies of the fault under Segundo showed that the earthquakes are occurring on a 6 km long fault. A fault of this length is capable of generating a magnitude 5.8 earthquake (Wells and Coppersmith, 1994).” In fact, on August 23, 2011, the same day as the Mineral Virginia M5.8 earthquake, a M5.3 earthquake occurred near Segundo. Since the swarms of 2001 and 2011, additional research is in progress based on the possibility that at least some of the seismic activity in this area has been triggered by water injections from gas production. In the Raton Basin the late Cretaceous Raton and Vermejo Formations host the coalbed methane. The late Cretaceous Trinidad Sandstone and Pierre Shale underlie the formations from which the methane is produced. Igneous dikes and sills associated with the Spanish Peaks intrusive complex locally intrude these formations. The Raton Basin is one of only a few sedimentary basins in the United States that has high geothermal heat flow. The Basin is located at the eastern edge of the Rio Grande Rift. There is a small volcanic anomaly just to the south of the seismic activity. Although widespread gas production is also present in the San Juan Basin in southwestern Colorado, there have been many more recent earthquakes in the Raton Basin than in the San Juan Basin. During gas production, water that is pumped from the sediments is re-injected under no pressure (gravity). Induced earthquakes usually involve pressurized injection into or near the basement. But the water from these injections is not under pressure and most of the events are in the basement, far below the wells. It is still to be determined whether a valid mechanism exists for the triggering of these earthquakes. This is important since the seismicity of the Raton Basin is having a very significant effect on the National Seismic Hazard Maps for this area and for others where induced earthquakes have been identified or are being investigated. Since earthquakes that are determined to be non-tectonic events are usually removed from the hazard calculation, it is very important that the Trinidad events be properly evaluated for their contribution to the hazard. We understand that, as part of the development of the maps, USGS is evaluating what “b” value and maximum magnitude is appropriate for triggered earthquakes or if they should somehow be considered deterministically.

Two faults in central Colorado, the Gore Range Frontal Fault and the Williams Fork Mountains Fault, are being added to the NSHM for 2014, bringing the total in Colorado to six (6).

CEHMC Co-Chair Rob Jackson is a member of the Earthquake Engineering Research Institute (EERI) Committee on the Seismic Safety of Schools. The American Clearinghouse on Educational Facilities (ACEF) is currently developing a resource publication which will provide best practices in school design as a proactive measure for natural hazards. Rob wrote the seismic section of the publication, entitled “Earthquake Safety Guidelines for Educational Facilities.” The document is posted on both the EERI and ACEF websites. Links are provided below:

<https://www.eeri.org/wp-content/uploads/Earthquake%20Safety%20Guidelines%20for%20Educational%20Facilities.pdf>

<http://online.tarleton.edu/ACEF/GuidelinesforEarthquakeSafetyinEducational/#/1/>

On October 10, Rob gave an earthquake talk to the ASCE/SEI Colorado Structural Group. On October 17, 2013, Colorado, along with Montana and Wyoming, participated in the first Great Rocky Mountain ShakeOut.

The CEHMC was represented at the Western States Seismic Policy Council’s 2013 Annual Meeting in Seattle and is participating in the WSSPC committees.

Submitted by Rob Jackson, Co-Chair, Colorado Earthquake Hazard Mitigation Council