Statement of

David Maxwell

Director

Arkansas Department of Emergency Management

And

Vice Chair

Central United States Earthquake Consortium

Before the

Ad Hoc Subcommittee on State, Local and Private Sector Preparedness and Integration

Committee on Homeland Security

United States Senate

Hearing on "The New Madrid Seismic Zone: Whose Fault is it Anyway?"

December 4, 2007

Washington, DC

Thank you Chairman Pryor, Senator Sununu and other members of the subcommittee. I appreciate the opportunity to appear before you today. I am David Maxwell, Director of the Arkansas Department of Emergency Management (ADEM) as well as the current Vice Chair for the Central United States Earthquake Consortium (CUSEC). ADEM's role in planning for an earthquake along the New Madrid seismic zone falls in two areas. The first and primary area of focus is to establish and implement an earthquake preparedness program to ensure the safety and wellbeing of the citizens of Arkansas from the risk associated with earthquakes within the state, and secondly to address those aspects outside the state which would certainly have a direct effect on Arkansas. We take an all hazards approach when planning and perform a gap analysis for specific hazards where needed. This requires the full cooperation of all other state and local government agencies, departments and personnel. CUSEC serves as the "coordinating hub" for the region, performing the critical role of coordinating multi-state efforts of the central region. While each individual state is the primary implementer of emergency management functions, CUSEC's role is largely facilitative in uniting and coordinating actions of the eight states in the New Madrid Seismic Zone (NMSZ) Alabama, Arkansas, Illinois, Indiana, Kentucky, Mississippi, Missouri and Tennessee.

In 1977 Congress enacted the Earthquake Hazards Reduction Act in recognition of the fact that earthquakes pose the greatest potential threat of any single-event natural hazard confronting the nation. It directed the President to "establish and maintain an effective earthquake hazards reduction program." In doing this, Congress created the National Earthquake Hazards Reduction Program which gives the responsibility to the federal government to provide direction, coordination, research and other support to efforts aimed at earthquake hazard mitigation and preparedness. The Federal Emergency Management Agency (FEMA), the United States Geological Survey (USGS), the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST) were assigned specific roles. While national attention focused on high-risk areas such as California, the late Dr. Otto Nuttli of St. Louis University was pioneering research on the danger of earthquakes in the central United States. His research provided the conclusive evidence that prompted the creation of CUSEC in 1983. FEMA in full cooperation with the states most at risk from a NM seismic event laid the ground work for the formation of the CUSEC in 1983. This partnership was built around four goal areas: public outreach and education, multi-state planning, mitigation and application of research to address the hazard and associated risk... The primary mission is "…the reduction of deaths, injuries, property damage and economic losses resulting from earthquakes in the central United States." Authority for CUSEC is vested in the Board of Directors, which is composed of the directors of emergency management for the eight member states.

As a member of the Governor's cabinet through my work with ADEM, we are heavily engaged in planning both preparation and response for both natural and man-made disasters within the state. We have held two table top exercises with Governor's staff, cabinet members and department heads, preparing for events that would follow a catastrophic earthquake along New Madrid. The last such exercise was held as recently as November 9th.

Being the Director at ADEM, I oversee every aspect of emergency management for the state of Arkansas. This includes the planning, mitigation, response and recovery efforts for an earthquake.

As part of our planning for worst case scenario, we have expanded our planning effort to 34 counties instead of the original 24. We conducted scenario driven earthquake workshops over the summer focusing on what is expected to happen should a 7.7 magnitude earthquake occur. According to U.S. Geological Survey, this is the most appropriate "characteristic" earthquake scenario. Here are just a few of the things that may happen:

The central U.S. serves as a major transportation corridor and it would be highly probable that transportation through the region would almost surely come to an abrupt stop. Coupled with this the major oil and petroleum pipelines crossing the region as well as the potential losses to the electrical grid that controls large areas of the central and eastern U.S. makes this not only a local/state problem but a national one as well.. . Unlike other areas which have experienced damaging seismic events the residents of the central U.S. are unprepared emotionally to face the devastating effects brought on by a seismic event.

Loss estimates using HAZUS-MH

- 34 County Study Region
- Approx 25,000 Sq. Miles
- 1.3 Million People
- 550,000 Buildings
- 540 Schools
- 48 Hospitals
- 2,800 Bridges
- 1,350 Rail Segments
- 75 Ports
- 125 Airport Facilities
- $32 Billion in Transportation
- $20 Billion in Utility System
- 120,000 buildings at least moderately damaged
- 20% of inventory
- 50,000 buildings beyond repair
- 25% of manufactured housing at least extensive damage
- 270 Bridges completely damaged
- 65% of hospital beds unavailable
- 50 schools w/complete damage
- 35% w/out Water
- 25% w/out Electric

An earthquake in the New Madrid seismic zone could strike seven or more states, causing major physical, social, and economic disruption to a region that is home to forty million people. Of the 44 million, approximately 12 million are at immediate risk. Memphis and Saint Louis make up the two largest cities in the region with approximately 1 million respectively. The remaining 8-9 million people at risk fall in the rural areas scattered between Memphis and Saint Louis. The potential losses from future earthquakes of magnitude 5.5 or greater in the New Madrid seismic zone are expected to be significant, for at least three reasons: 1) the central US has a high percentage of structures not designed and constructed to withstand the effects of earthquakes; 2) the region is characterized by poorly consolidated sedimentary rocks, which are poor foundation material; and 3) a New Madrid quake would impact a multi-state region (about 10 times larger than the area impacted by a California earthquake of comparable size).

The consequences from a major New Madrid earthquake would be substantial, estimated from $60 to $100 billion for one of three projected events, or a total of $150 to $200 billion in losses. The destruction to the transportation system would make up a significant portion of those losses.

- Direct loss of life due to collapse or structural failure of the lifeline.
- Indirect loss of life due to an inability to respond to secondary catastrophes, such as fires, and/or provide emergency medical aid.
    - Delayed recovery operations.
    - Release of hazardous products (e.g., losses from tank cars derailed by track failure, gas leaks from ruptured utility lines) and environmental impacts.
    - Direct loss of property and utility service (e.g., the collapse of a bridge carrying utilities).
    - Losses due to interruption of access (e.g., export losses due to port damage).
    - Disruption of economic activity across the region and nation as well as in the community directly affected.

However, there are other earthquake related hazards that can affect transportation systems. These hazards are: (1) faulting, which results in rupture of the earth's surface; (2) ground failures, which can result in liquefaction, slope instability, and subsidence; and (3) induced physical damages, such as flooding, dam or levee failures, landslides, fires and hazardous materials releases.

Liquefaction could be an enormous problem in a large earthquake. Buildings and infrastructures such as roads, bridges, power lines, gas lines, water lines, telephone lines, etc. could all be damaged by the moving land. This could cause difficulty during rescue or recovery efforts following an earthquake. Many of these infrastructures will be needed but many will take a long time to repair.

Community Vulnerability

Communities in the Central U.S. - both large and small - are vulnerable to even moderate sized earthquakes (magnitude 5.5 and greater). One of the principal reasons is that the older downtown areas are largely constructed of un-reinforced masonry structures, which are among the most vulnerable structures from the effects of ground shaking. This is especially true in rural communities where un-reinforced masonry constructed buildings make up a greater percentage of structures.

A central question is what will happen to the population in a damaging earthquake? There is no simple answer. The number of casualties will depend on several factors: time of day of the earthquake, location and depth of the epicenter, and magnitude, duration of the quake, and the magnitude of aftershocks.

A major concern of emergency managers is critical facilities, or, those buildings and systems that are critical to effective response and recovery operations. These include law enforcement, fire, emergency operations centers, hospitals and other medical care facilities, and schools.

Given the large number of dams and the extensive network of reservoirs and levees along the region's river systems, significant flooding from earthquake induced breaks in dams and levees should be expected at high water periods. Roads and bridges would also be damaged, compounding response and recovery efforts.

Highway Transportation
The major components of the highway transportation system are pavements, bridges, overpasses, viaducts or elevated expressways, tunnels, embankments, slopes, avalanche and rock shelters, retaining walls, and maintenance facilities. Roadways and bridges are of primary concern, since their loss of function will have the greatest impact on the ability to move people and equipment after the earthquake.

Roadways will sustain damages in a New Madrid earthquake, primarily from surface displacements, liquefaction, slope instability and earthquake induced flooding from broken levees during high water events. Pavements will crack in a damaging New Madrid earthquake, principally due to ground failure (such as liquefaction). Critical links in the interstate system, including Interstate 55 and Interstate 40, would in all likelihood be closed due to failures to approaches to bridges, and damage to the pavement itself.

Hazardous Materials Spills
Hazardous materials are a by-product of the economy of the Central U.S. As a major transportation corridor, tremendous volumes of hazardous materials pass through this region by rail, highway, and river. Oil and natural gas pipelines also crisscross near or through the New Madrid seismic zone, transporting 4 million barrels per day of crude oil, petroleum products and natural gas. As metropolitan areas in the Central U.S. continue to grow, more and more people live and work near industrial and commercial facilities that process or store hazardous materials. Hazardous materials releases and spills are a major earthquake induced hazard, one that will have a regional impact. The transportation system that we depend on to move hazardous materials products is clearly vulnerable to earthquakes.

Vulnerability of Inland Waterways and Ports
An earthquake in the New Madrid seismic zone would have two direct impacts on the inland waterways system: first, it could seriously impede the navigability of the rivers and canals; and secondly, an earthquake could cause serious damages to port facilities.

In essence, inland waterways, which are counted on to provide an economical source of transportation for the movement of bulk goods across the region, can suddenly become dysfunctional as a result of an earthquake. Furthermore, alternative modes of transportation for bulk goods – notably railroad – would also be rendered inoperable for extended periods of time.

Air Transportation
It was not until 1990 that federal owned or funded buildings including airport facilities – had to be designed for earthquakes. However, even if an airport is designed and constructed to conform with building codes which require seismic design, that design represents only minimum standards to provide for life safety. This translates into the following conclusion: terminals and control towers will suffer damage during an earthquake.

Liquid Fuel and Transport
Airplanes need fuel, and this fuel is typically stored in above ground storage tanks and is transported through underground pipelines to airplane gate areas. The immediate problem is the threat of fire and explosion as a result of rupture to the tanks and underground pipelines. For the most part, building codes do not address the seismic design of liquid fuel storage tanks or underground pipelines.

Business Vulnerability
At least two categories of businesses will be impacted by an earthquake: first, the large retail chains that tend to be located in local or regional shopping centers; and second, the locally owned businesses that often operate with limited capital, typically in a building that is rented or leased. For the first category, a damaging earthquake may mean the temporary closing of a few outlets; for the second category - the independent merchant - an earthquake can spell disaster: loss of building, loss of inventory, loss of utility services, and loss of market share, which in many cases, can lead up to complete loss of business.

Earthquakes in the central or eastern United States affect much larger areas than earthquakes of similar magnitude in the western United States. For example, the San Francisco, California, earthquake of 1906 (magnitude 7.8) was felt 350 miles away in the middle of Nevada, whereas the New Madrid earthquake of December 1811 (magnitude 8.0) rang church bells in Boston, Massachusetts, 1,000 miles away. Differences in geology east and west of the Rocky Mountains cause this strong contrast.

Sources:
Central U.S. Earthquake Consortium (CUSEC) Publications:
- EARTHQUAKE VULNERABILITY OF TRANSPORTATION SYSTEMS IN THE CENTRAL UNITED STATES
REDUCING THE RISK: EARTHQUAKES IN THE CENTRAL UNITED STATES

Arkansas continues to make significant investments in our preparedness and response capabilities as well as all of the CUSEC states. Earlier I referred to a series of earthquake workshops which were held with local governments in the state, in cooperation with FEMA, CUSEC, USGS, Mid-America Earthquake Center, Innovative Emergency Management Incorporated (IEM) and Arkansas Geological Survey to enhance the state's preparedness. They focused on direction and control, communications, damage assessment, first responder issues, medical and mass care, transportation and evacuation, debris management, congregate shelter, reception areas and infrastructure recovery CUSEC coordinated similar workshops with all eight New Madrid states. The state of Arkansas has also conducted several other events:

- NMSZ Hazard/Threat Assessment Workshop – May 20, 2007 (Workshops are now considered exercise activities per HSEEP doctrine)

- Operation Poseidon NMSZ Functional Exercise – June 19, 2007

- EPA/USCG/FEMA Sponsored Spills of National Significance (SONS) 2007 Full Scale Exercise – June20-21, 2007

- Senior Executive Officials New Madrid Earthquake Tabletop Exercise (Governor's Office and Cabinet) – November 9, 2007

- Deputy Director's New Madrid Earthquake Tabletop Exercise (Lieutenant Governor's Office and State Agency deputies) – November 27, 2007

The following list of participants is comprehensive to the exercise activities listed above:

Federal Participants:

DHS / FEMA
EPA
US Geologic Survey
US Coast Guard
US Army
US Air Force
US Navy
US Marine Corps
USA Corps of Engineers
Health and Human Services

Certainly I want to mention the work between the state survey and ADEM and USGS in support of the SONS exercise and cat planning. It's a strong link between CUSEC the states and NEHRP.

State Participants:

Governor's Office
AR Dept of Emergency Management
AR Department of Health
AR Department of Human Services
AR Geologic Survey
AR Dept of Information Services
AR Highway & Transportation Dept
AR Department of Corrections
AR Banking Department
AR Insurance Dept
AR Dept of Finance & Administration
AR State Police
AR National Guard
AR Dept of Environmental Quality
AR State Crime Lab
AR Wing, Civil Air Patrol
Radio Amateur Civil Emergency Services
American Radio Relay League (AR Section)

Local Participants (multi-disciplinary and multi-agency representation):

34 Earthquake Counties, cities in those counties and first responders of those counties.

Non-Governmental Organization/Private Sector

American Red Cross
Wal-Mart

In 2007, exercise activities occurred several weeks to several months apart. The State of Arkansas Draft Multi-Year Training and Exercise Plan has tentatively identified the following dates for execution of the New Madrid Earthquake Exercise Series:

1st Quarter 2008 – High Impact County TTX Series
April 2008 – State Response Functional Exercise
October 2008 – State/Local Response TTX
1st Quarter 2009 – State/Local Response Full Scale Exercise

2nd Quarter 2009 – State/Local Response Workshop
3rd Quarter 2009 – State/Local Response TTX
4th Quarter 2009 – State/Local Response Functional Exercise

Along with our exercises we have preparedness efforts that focus on education and outreach. We meet with local school districts and practice earthquake drills along with holding town meeting to address specific concerns of individual communities. We piloted a 'Sister County' concept and aligned the 24 eastern counties that are forecasted to experience a catastrophic earthquake with a sister county. The primary purpose is to respond quickly once the event has occurred with a NIMS structured Rapid Needs Assessment Team. In May of 2006 we positioned an earthquake planner in eastern Arkansas to focus specifically on county Emergency Operations Plans. That person is there solely to coordinate with counties in that region and assist them with improving their plans. Disasters are local and ADEM is doing everything to ensure that citizens in our counties are prepared to the fullest extent.

There is always work to be done in preparedness. While I cannot show you where preparedness works, I can show you where it was not used. New studies are being published everyday. Therefore, we are never finished in the literal sense. We exercise and plan according to the current research and upgrade it constantly to keep up with new developments. There will always be a need to practice coordination between the local, state and federal organizations involved. A challenge will always be the lack of warning that an earthquake presents. Hurricane Katrina provided a warning to all states that we had not taken catastrophic planning far enough. Arkansas has no plans of underestimating the possible damage from a planning standpoint. We will continue to use worst-case scenarios as we develop our response plans. Arkansas as well as the other CUSEC member states are constantly improving their catastrophic plans to address issues that will arise when an earthquake strikes. The biggest challenge we have is selling the need for preparedness on earthquakes. Because we do not live in a state where earthquakes are a regular occurrence, the thought tends to be that they will not happen. Most citizens just assume that they will go on with life as usual and not relocate even if one does occur. And because a large portion of the affected state is rural we must prepare to handle logistics on site. We must be prepared to take care of the citizens of Arkansas wherever they are located.

While we all have read and heard numerous times that earthquakes cannot be prevented, certainly we can minimize casualties and damages by being prepared. I cannot overemphasize the importance of awareness/self-preparation. As we all know, a catastrophic earthquake will be unlike any other disaster the region has previously experienced. With a tornado for example, those affected can expect the arrival of many, many people rushing to help as quickly as they can get there. Sadly, however, we all know that would not be the case with an earthquake, which is why we cannot have too much awareness and preparation. We will continue to hold scenario based exercises and identify any gaps in our planning efforts. I strongly feel that a TOPOFF exercise involving all levels of government to focus on an earthquake along the New Madrid is extremely important. This week all of the CUSEC states are meeting to synchronize exercise activities. We are planning a Full Scale Exercise in 2011 on the 200 year anniversary of the catastrophic 1811-1812 earthquakes. The federal government (FEMA) is helping tremendously with funding the workshops mentioned but funding as yet to be secured to support the planned exercise.. I hope there will be funds made available to help the states fill in the identified gaps

and not have the situation as with the Hurricane Pam exercise with Katrina following without the identified gaps or concerns being addressed. If we are ready and prepared, we can significantly minimize casualties and the effects of the earthquake.

Thank you so much for your kind attention. It has been my honor to be with you today.