Incident Specific Annex 8
Earthquake

Coordinating Agencies	Support Agencies and Organizations
West Virginia Division of Homeland Security and Emergency Management (WVDHSEM)	All agencies and organizations listed in all Emergency Support Function Annexes

Purpose

This annex dentifies how county, state and federal agencies will prepare, respond and support the response, to an earthquake event affecting West Virginia and surrounding states.

Scope

- This annex applies to all Emergency Support Functions (ESFs) of the State of West Virginia.
- Identifies roles and responsibilities of agencies at the local, state and federal levels to provide a framework for the coordination of state resources to ensure the safety of life and property following a catastrophic earthquake.
- Establishes the policies and procedures for use when responding to the damaging consequences of an earthquake in West Virginia, whether occurring in West Virginia or surrounding states.
- Establish how the state will mobilize resources to support local emergency management efforts through preparedness, response, planning and recovery from an earthquake event impacting West Virginia, whether occurring in West Virginia or surrounding states.

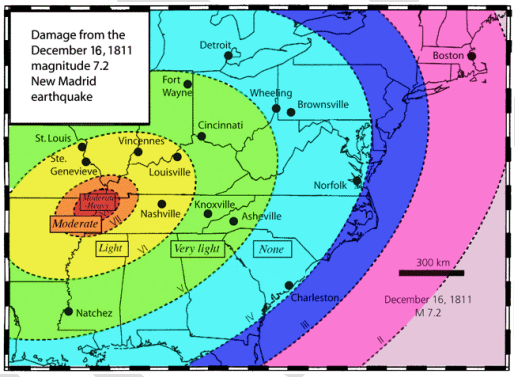
Policies

- Procedures in this annex will be implemented as outlined in the West Virginia Emergency Operations Plan, Basic Plan.
- Procedures in this annex will be automatically implemented under the following conditions:
  - When determined necessary by the Director, West Virginia Division of Homeland Security and Emergency Management (WVDHSEM).
  - When any area in West Virginia experiences a damaging earthquake, usually a magnitude of 4.5 or greater.

- When an earthquake event occurs in the New Madrid Seismic Zone that produces significant damage in West Virginia.
- When assistance is requested by adjoining states in response to an earthquake.
- This annex identifies the major response and recovery activities undertaken by state and adjunct agencies in response to a catastrophic earthquake.

Situation

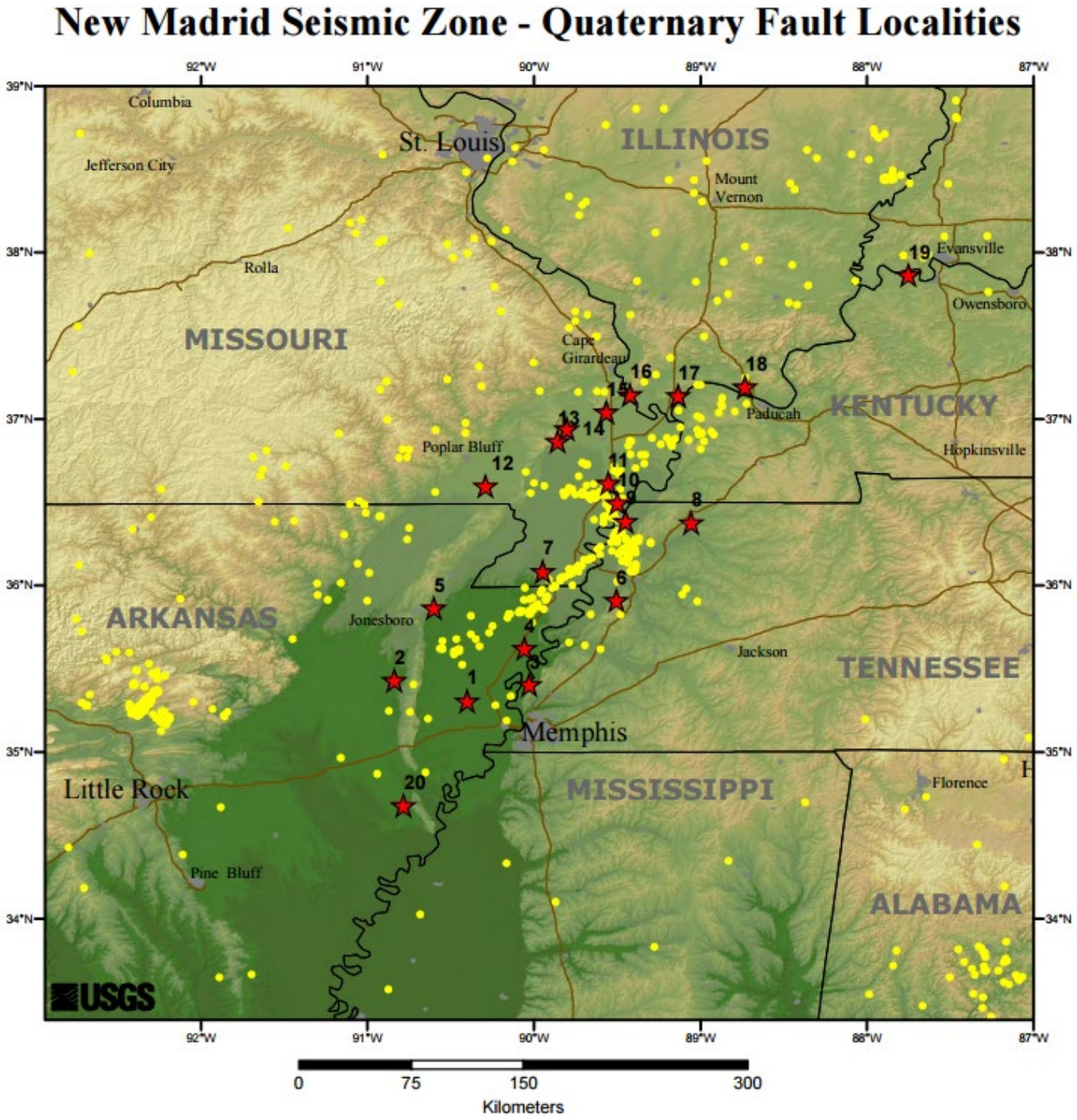
- **West Virginia is considered a state that is *low-risk* for earthquakes.**
- West Virginia's proximity to states in the New Madrid Seismic Zone will make West Virginia a state providing support in the event of a New Madrid earthquake.
    - **The New Madrid Seismic Zone is at Significant Risk for Damaging Earthquakes. 1811-1812 Summary.**



- Three Main Shocks
    - December 16, 1811 - Magnitude ~7.5
    - January 23, 1812 - Magnitude ~ 7.3
    - February 7, 1812 - Magnitude ~ 7.5
- December 16, 1811 - Magnitude ~7.0
    - Six aftershocks in the first two days in the range of M5.5 to M6.3
    - Hundreds of quakes felt into 1813
- It's happened before 1811-1812
    - The geologic record of pre-1811 earthquakes reveals that the New Madrid seismic zone has repeatedly produced sequences of major earthquakes,

including several of magnitude 7 to 8, over the past 4,500 years

- http://earthquake.usgs.gov/earthquakes/states/events/1811-1812.php



This map of the New Madrid seismic zone shows earthquakes with magnitudes larger than 2.5 as yellow circles. The red stars represent localities where Quaternary faulting, sites that are generally less than about 75,000 years old, has been detected in the subsurface.

- The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction

- This scale, composed of increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects.

- The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects actually experienced at that place.

- The **lower** numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The **higher** numbers of the scale are based on observed structural damage.

- Structural engineers usually contribute information for assigning intensity values of VIII or above.

- Magnitude measures the energy released at the source of the earthquake. Magnitude is determined from measurements on seismographs.

The following is an abbreviated description of the levels of Modified Mercalli intensity.

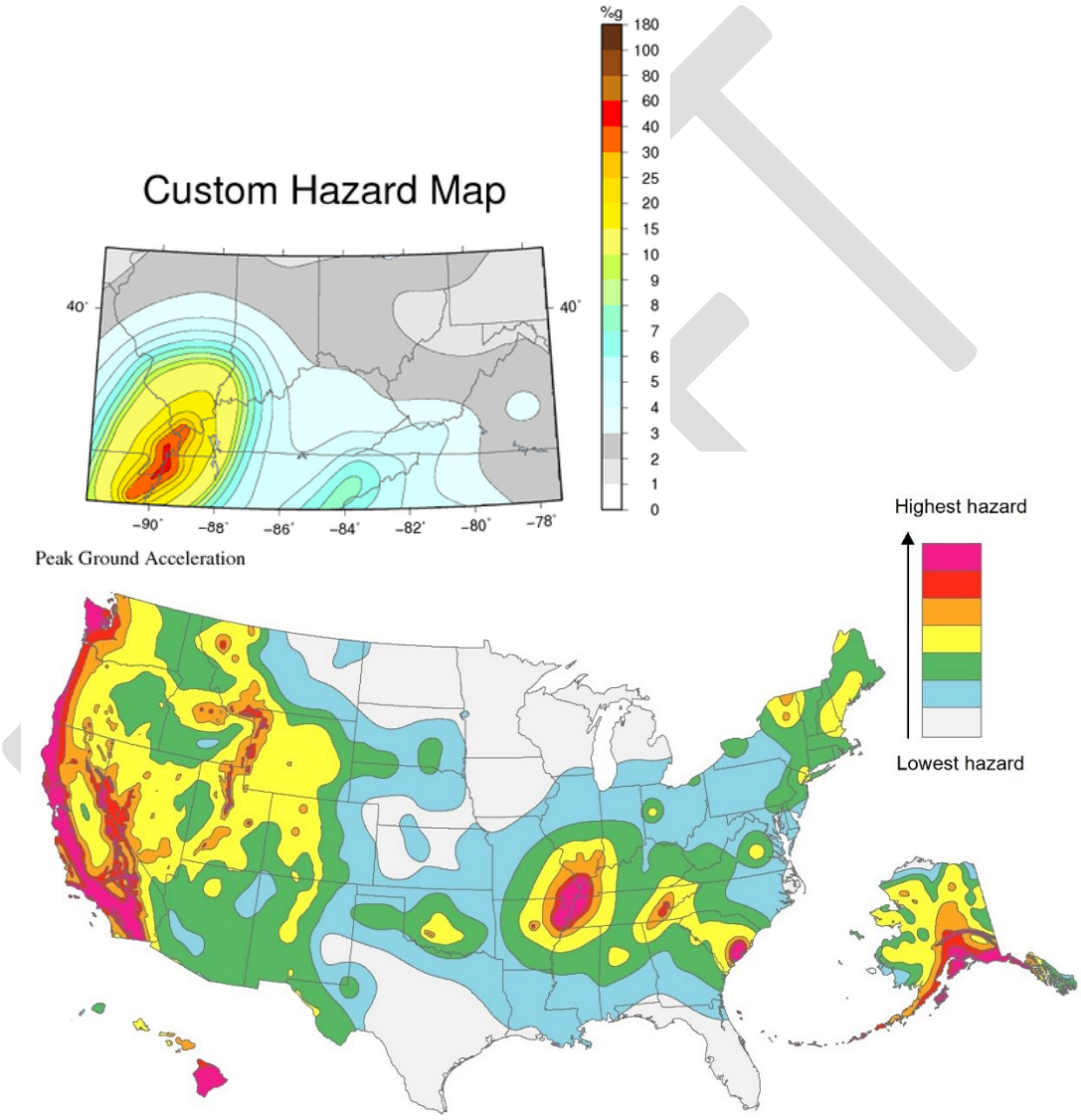
Intensity	Magnitude	Shaking	Description/Damage
I	**1.0 - 3.0**	Not felt	Not felt except by a very few under especially favorable conditions.
II	**3.0 - 3.9**	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III		Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	**4.0 - 4.9**	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V		Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	**5.0 - 5.9**	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	**6.0 - 6.9**	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	**7.0 and higher**	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX		Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X		Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Abridged from *The Severity of an Earthquake*, a U. S. Geological Survey General Interest Publication. U.S. GOVERNMENT PRINTING OFFICE: 1989-288-913

- Technical hazards occur with earthquakes requiring special skills to mitigate. Fires with hazardous material spills, search and rescue to include shoring and stabilization, transportation of casualties and needed response equipment through/over rubble in affected areas, and restoration of damaged infrastructure.

- Damage caused to buildings and infrastructure varies, depending on the nature of the ground beneath the structure, building construction and age. Unreinforced masonry buildings are among the most susceptible to severe damage. Wood structures tend to withstand earthquakes better than brick or unreinforced masonry buildings.

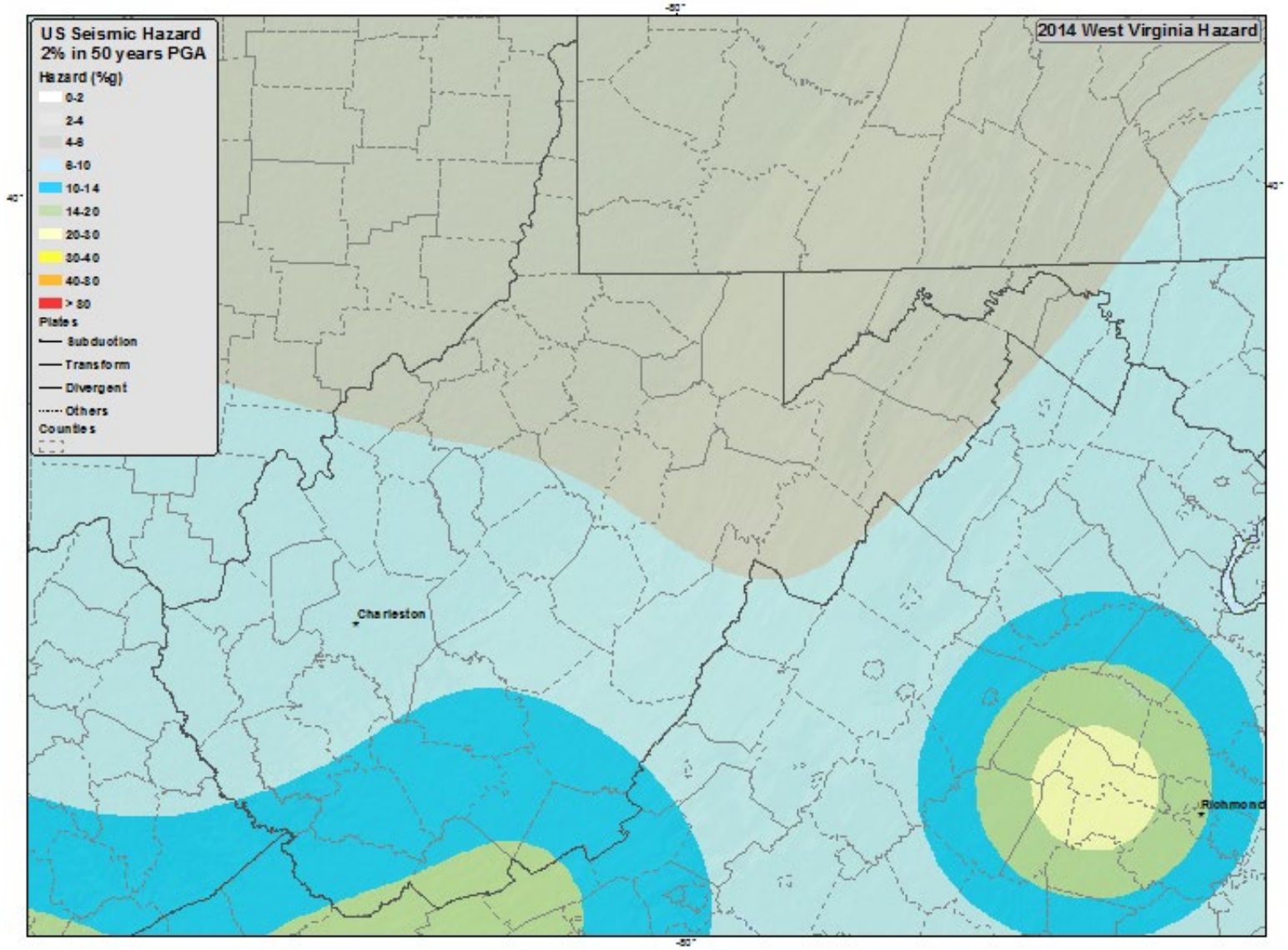
- Earthquake risk is the probable building damage and number of people that are expected to be hurt or killed if a likely earthquake on a particular fault occurs. Earthquake risk and earthquake hazard are occasionally incorrectly used interchangeably.



Quaternary Fault and Fold

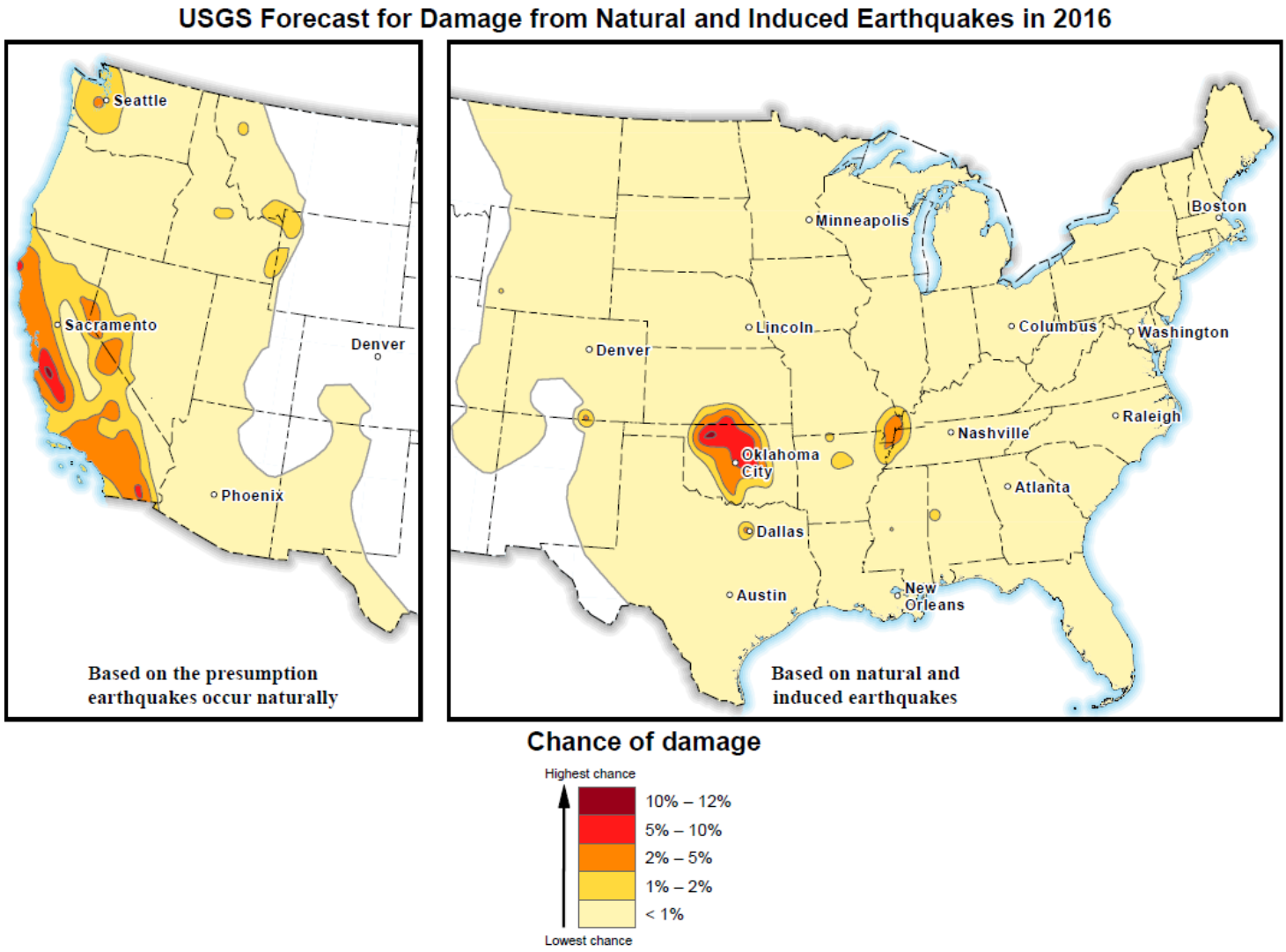
Quaternary fault and fold database for the United States, accessed April 1, 2016 from USGS web site: http://earthquake.usgs.gov/hazards/qfaults.

Largest Earthquake in West Virginia



Southern West Virginia
1969 11 20 01:00:09.3 UTC (Local 11/19)
Magnitude 4.5
Intensity VI - Largest Earthquake in West Virginia

Minor damage occurred in Giles County, Virginia, at Glen Lyn and Rich Creek, and at three towns in southern West Virginia. At Glen Lyn, a few bricks were knocked from a chimney, windows were broken, and plaster was broken from most of the walls in an old house. At Rich Creek, plaster cracked and fell and windows were broken. A cornice reportedly was shaken from one building in Henry County, at Collinsville, Virginia. Windows also were broken in southern Mercer County, West Virginia, at Lerona, Oakvale, and Elgood. Felt over all or parts of nine States: Georgia, Kentucky, Maryland, North Carolina, Ohio, South Carolina, Tennessee, Virginia, and West Virginia.



USGS map displaying potential to experience damage from natural or human-induced earthquakes in 2016. Chances range from less than 1 percent to 12 percent.

Planning Assumptions

- This plan assumes a major earthquake will not occur in West Virginia.
- This plan assumes an earthquake that is considered "very strong" (measuring 6.0 or greater magnitude) will occur in the New Madrid Seismic Zone.
- West Virginia will be requested to provide support to surrounding states affected by an earthquake in the New Madrid Seismic Zone.
- Earthquakes occur without warning and could cause significant damage, injury, loss of property and loss of life.

- Earthquakes can trigger a number of other events, such as hazardous material releases and spills, and conflagration fires.

- Public utilities and private infrastructure (such as power, water, sewer, natural gas networks, phone lines and towers) may be damaged and unusable immediately following an earthquake.

- Roads, bridges, highways, airports and waterways may become impassible/unusable following a significant seismic event.

- West Virginia citizens and citizens in affected states may be without food, water, shelter, heat, sanitary facilities and transportation for extended periods.

- West Virginia may become overwhelmed by influx of displaced citizens who need alternate housing or shelter because of damaged communities.

- West Virginia public safety resources (including personnel) may become overwhelmed and a shortage of resources to assist with local response and recovery efforts may occur.

Organizational Structure

- At the local level, local emergency managers will coordinate emergency response.

- At the state level, earthquake response coordination is the responsibility of WVDHSEM.

- Requests for support will be generated through the state's emergency management information system by the local emergency manager. The Shift Leader in the West Virginia State Emergency Operations Center (WVSEOC) will prioritize and staff requests for execution.

- WVDHSEM will coordinate all requests for assistance from other states affected by an earthquake via the Emergency Management Assistance Compact (EMAC).

Concept of Operations

The State of West Virginia and local jurisdictions exercise the preeminent authority to make decisions regarding management of response to an earthquake. The federal government will provide assistance, as required and requested by the State of West Virginia. The National Response Framework (NRF) provides the Department of Homeland Security (DHS)/ Federal Emergency Management Agency (FEMA) an outline for the coordination of federal support agencies in response to requests from the State of West Virginia.

Agency Responsibilities Matrix

Supporting Agency	Acronym	Responsibilities
West Virginia Division of Homeland Security and Emergency Management	WVDHSEM	• Act as the overall coordination and control for state and local emergencies. • Coordinate the safety and well-being of the citizens of West Virginia. • Advise and keep the Governor informed of any issues or updates. • Request support from other states via EMAC. • Request additional assistance from FEMA, on behalf of the Governor. • Support the plan of the local Emergency Management Directors and help to meet any shortfalls. • Receive and Track resource requests from local Emergency Directors, and coordinate response resources with appropriate agencies. • Conduct a preliminary damage assessment. • Schedule, manage, and coordinate yearly training requirements for Emergency Management Directors. • Track costs associated with emergency response. • Provide oversight and guidance to other state agencies as they go through the audit process. • Notifying the public. See ESF 15 for more information. • Monitoring the situation. • Provide available support to other states, as requested via EMAC.

Authorities & References

Authorities

State of West Virginia Emergency Services and Disaster Laws

References

West Virginia Code §15-5-5, "General Powers of the Governor," as amended
West Virginia Code §15-5-6, "Emergency Powers of the Governor," as amended
National Incident Management System (NIMS)
National Response Framework (NRF)
West Virginia State Emergency Operations Center (WVSEOC) Emergency Operations Plan (EOP)
West Virginia Emergency Operations Plan, Basic Plan

*EMAP Standard*s

4.4.3 – Emergency Operations Plan

RECORD OF CHANGES

CHANGE NUMBER	DATE OF CHANGE	PAGE/CHANGE	CHANGE MADE BY (SIGNATURE)
1	5/1/2017	IS 8-12, (Record of Changes Added)	
2	5/1/2017	IS 8-11, EMAP Standard Added, (4.4.3 – Emergency Operations Plan)	