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## EARTHQUAKE ANNEX Q

### Q1. Purpose, Situation, and Assumptions

#### Q1.1 Purpose

The purpose of this Earthquake Hazard-Specific Annex is to guide and coordinate agencies and organizations following earthquakes affecting Park County. Earthquakes can cause immediate and significant damage to structures and infrastructure, trapping occupants, disrupting essential services, and creating continuing threats due to damaged infrastructure. General incident management principles and disaster and emergency processes should be applied to any incident, but this annex provides additional information specific to earthquakes.

#### Q1.2 Situation Overview

Park County is in one of the most active earthquake areas of the nation. The county lies near the junction of the Intermountain Seismic Belt and Centennial Tectonic Belt and is in close proximity to Yellowstone National Park, a very active geologic area. Known, potentially active faults in Park County include Emigrant Fault, East Gallatin Reese Creek Fault, Gardiner Fault, Mammoth Fault, and Mol Heron Creek Fault. The Emigrant Fault in the Paradise Valley is generally the most active fault.

Earthquakes within and centered outside Park County can have profound impacts. The most significant damage from most earthquakes is to construction. Bridges are particularly vulnerable to collapse. Buildings vary in susceptibility, depending upon construction and the types of soils on which they are built. Fires caused by ruptured gas mains may also destroy structures. Dam failures, avalanches, and landslides may also be resultant hazards. The 500 year earthquake for Park County is expected to cause over \$52 million in building-related economic losses. (Park County Hazard Mitigation Plan, August 2005)

Geologists primarily measure earthquake severity in two ways: by magnitude and by intensity. Magnitude is based on the area of the fault plane and the amount of slip. The intensity is based on how strong the shock is felt and the degree of damage at a given location. The most commonly used scales are the Richter magnitude scale, moment magnitude scale, and modified Mercalli intensity (MMI) scale. Table Q1.2A shows a comparison of magnitude and intensity and a description of likely impacts.

*Table Q1.2A Earthquake Magnitude and Intensity Scales*

<b>Richter Magnitude</b>	<b>Typical Max. MMI</b>	<b>Typical Maximum Effects</b>
1.0 – 3.0	I	Not felt except by a very few under especially favorable conditions.
3.0 – 3.9	II – III	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.

Table Q1.2A Earthquake Magnitude and Intensity Scales (continued)

Richter Magnitude	Typical Max. MMI	Typical Maximum Effects
4.0 – 4.9	IV – V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 – 5.9	VI – VII	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.
6.0 – 6.9	VII – IX	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.
7.0 and higher	VIII or higher	Damage total. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly. Objects thrown into the air.

Source: US Geological Survey website, 2011.

Possible earthquake losses include:

- Structure and contents losses, including critical facilities.
- Critical function losses.
- Loss of potable water.
- Sewer line breaks.
- Gas line breaks.
- Electric and communications outages.
- Damages to roads, bridges, and runways.
- Business losses.
- Historical losses.
- Deaths and injuries.

### Q1.3 Planning Assumptions

- Most earthquakes occur without warning.
- The geographic extent of earthquake impacts may range from localized in a single community to countywide.
- The initial earthquake may be a predecessor to a larger earthquake.
- Strong earthquakes may be followed by aftershocks.
- Communications and transportation capabilities may be limited following an earthquake.
- Critical facilities may be impacted and response capabilities affected by strong earthquakes.

## Q2. Concept of Operations

The decision points that follow are the responsibility of incident management. Note that not all decision points may be necessary and some decision points may be combined during rapidly escalating situations.

- Decision Point: A damaging earthquake occurs and local response is needed.

Most people can recognize large earthquakes and responders may be able to assume some level of damage has occurred. Since earthquakes can damage communications infrastructure and overwhelm the 911 centers, some level of automatic mobilization may be needed. After ensuring loved ones are safe, local responders should prepare supplies and equipment for extended emergency operations and respond to their nearest duty/work station, unless instructed otherwise. Note that bridges and roadways can be significantly damaged in earthquakes and extreme caution should be used when traveling.

Even if communications systems are operational, dispatchers may initially be too overwhelmed to adequately and formally alert all responders. Off duty responders should monitor radio traffic and coordinate with agency/department supervisors, if possible. Judicious use of radio and telephone communications is recommended.

Park County and Livingston principal executive officers / local elected officials, Disaster and Emergency Services coordinators, and other emergency management personnel (such as Public Information Officers, technical support staff, etc.) should respond to the Emergency Operations Center (EOC) to begin resource requests, coordination, and management. Depending on the damage to structures, the EOC may be in its primary or alternate locations. Clyde Park officials should respond to the Clyde Park Fire Station initially.

Following a major earthquake, an overwhelming number of incidents within the earthquake incident are likely and response and dispatch agencies may be forced to prioritize incident responses.

- Decision Point: Initial coordination of resources is needed.

Community fire stations are the most logical initial staging locations following an earthquake, especially when communications systems are inoperable or overwhelmed. Once prepared with the necessary equipment and supplies, responders should report to the closest community fire station for assignment. Possible assignments immediately following a large earthquake include:

- Respond to reported medical emergencies.
- Control hazardous material releases (gas leaks are common following earthquakes). See the [Hazardous Material Release Annex](#) for additional information.
- Extinguish fires.
- Extricate injured persons from collapsed structures.
- “Sweep” the community for trapped persons, gas leaks, fires, water breaks, and other hazards.
- Evacuate people from dam inundation areas, if dam failure is indicated or likely. See the [Population Protection Annex](#) and [Flood / Dam Failure Annex](#) for additional information.
- Provide mutual aid to a more severely impacted jurisdiction.
- Perform community damage assessments. See the [Damage Assessment Annex](#) for additional information.

- Decision Point: *Community members are in need of immediate rescue, shelter, and/or care.*

Following an earthquake that destroys or renders residences uninhabitable, the public will likely have basic survival needs. Initially, search and rescue operations with local fire department resources and mutual aid may be conducted, perhaps eventually supplemented by national urban search and rescue teams. See the [Mass Casualty and Mass Fatality Annex](#) for additional information on handling high numbers of injuries and fatalities.

Shelter and mass care services can be provided at locations inspected for structural damage and deemed able to withstand aftershocks. See the [Shelter / Mass Care Annex](#) for more information on providing these services.

- Decision Point: *Initial damage assessments are needed.*

Unless otherwise directed or needed, responders should make a quick visual evaluation of the following facilities in their local communities:

- Unreinforced masonry buildings (older stacked brick structures)
- Schools
- Commercial / industrial structures with basements or elevators
- Major or large scale structures or commercial / industrial facilities
- Facilities with hazardous materials
- Bulk fuel facilities
- Roadways
- Bridges
- Dams
- Landslide / washout prone locations
- Operational infrastructure sites (sewage / water treatment facilities, repeater sites, pump / lift stations, reservoirs, water storage tanks, etc.)
- Electrical distribution facilities
- Hospitals and nursing homes
- Structures with high occupancy loading

Findings of these initial evaluations should be provided to the Emergency Operations Center or local Incident Commander. See the [Damage Assessment Annex](#) for additional information.

- Decision Point: *Structure evaluations and long term recovery efforts are needed.*

Site-by-site structure evaluations by qualified building inspectors may be needed to ensure critical facilities, businesses, and residences are sound enough for occupancy, especially with the occurrence of aftershocks. Mutual aid resources and federal resources will likely be needed to perform this function. Similar inspection and repair processes should be conducted by the water, sewer, and utility operators and street and road departments. In some cases, repairs to infrastructure may take weeks or longer. When public property is damaged, the processes outlined in the [Base Plan, Section 7.1, Finance/Administration](#) should be followed.

Since most homeowners insurance policies do not cover earthquake damages, state and/or federal assistance may be needed for disaster recovery. See [Sections 2.5 and 2.6 of the Base Plan](#) for more information on the assistance programs available. Refer to the [Public Information Annex](#) for more information on providing recovery information to the public.

### **Q3. Organization and Assignment of Responsibilities**

The responsibilities listed here are specific to this hazard. Note that all entities, whether listed or not, are also responsible for their basic disaster and emergency responsibilities as outlined in the [Base Plan, Section 3.2](#), as applicable.

The following entities are not specific to jurisdiction. Therefore, in an emergency, the jurisdiction(s) affected will have the responsibility for these roles, and other non-affected jurisdictions may also be involved through mutual aid.

#### **Disaster and Emergency Services**

- Notify and coordinate with Voluntary Organizations Active in Disaster (i.e. American Red Cross, Salvation Army, etc.) for shelter and/or mass care services.
- Through the EOC, coordinate community-wide damage assessments.

#### **Fire Departments / Districts**

- Extricate and rescue victims.

#### **Government Administration**

- Using building inspectors and engineers, either employees, mutual aid, and/or contracted, inspect buildings for damage and determine occupancy status (red = do not enter; yellow = some damage, minimal occupancy; green = normal occupancy).

#### **Other Entities**

- Assess damages to associated structures and infrastructure.
- Conduct emergency repairs, as needed.
- Perform other duties as needed and assigned.

### **Q4. Direction, Control, and Coordination**

Incident Command for earthquake incidents will most often be managed through Unified Command as designated by the jurisdiction(s) having authority, usually consisting of the follow organizations:

- Law Enforcement
- Fire Departments
- Disaster and Emergency Services
- Principal Executive Officers / Local Elected Officials

Unified Command will be utilized for overall management of the earthquake. On scene Incident Commanders (ICs) will be utilized for incidents. These ICs will come from various emergency response agencies as available. Additional information on the direction and control function can be found in the [Direction and Control Annex](#) and [Base Plan, Section 4](#).

## Q5. Information Collection and Dissemination

### Q5.1 Information Collection for Planning

Table Q5.1A lists the key information needed and possible sources following an earthquake.

*Table Q5.1A Possible Information Sources*

<i>Information Type</i>	<i>Source</i>
Extent of community damage	<ul style="list-style-type: none"> <li>- Law Enforcement</li> <li>- Fire Departments</li> <li>- American Red Cross</li> <li>- Building Inspectors</li> </ul>
Extent of infrastructure damage	<ul style="list-style-type: none"> <li>- Street and Road Departments</li> <li>- Utility Providers</li> <li>- Water and Sewer Departments / Districts</li> </ul>
Number of casualties and conditions	<ul style="list-style-type: none"> <li>- Local/Area Hospitals</li> <li>- Emergency Medical Services / Ambulance</li> <li>- Fire Departments</li> </ul>
Number of fatalities	<ul style="list-style-type: none"> <li>- Park County Coroner</li> </ul>
Shelter populations / Mass care statistics	<ul style="list-style-type: none"> <li>- American Red Cross</li> <li>- Salvation Army</li> <li>- Disaster and Emergency Services</li> </ul>
Technical information on earthquakes	<ul style="list-style-type: none"> <li>- Montana Bureau of Mines and Geology</li> </ul>

### Q5.2 Public Information

Information regarding the public information function can be found in the [Public Information Annex](#).

The following information should be provided to the public:

- Recommended actions (leave home if significantly damaged, inspect utilities and shut off if damaged or unsure, open cabinets carefully, help neighbors, etc.)
- Road, bridge, and area closures
- Shelter locations
- Feeding and/or food and water distribution points
- Disaster assistance centers
- Disaster recovery information

## **Q6. Communications**

See the [Communications Annex](#) for more details on emergency communications in Park County.

## **Q7. Administration, Finance, and Logistics**

### **Q7.1 Finance/Administration**

For additional information on the Finance/Administration function, particularly the importance of recordkeeping, see the [Base Plan, Section 7.1](#).

### **Q7.2 Logistics**

For additional information on disaster and emergency logistics, see the [Base Plan, Section 7.2](#).

## **Q8. Plan Development and Maintenance**

See the [Base Plan, Section 8](#) for additional information on annex development, review, revision, and exercise.

## **Q9. Authorities and References**

### **Q9.1 Authorities / References**

- US Geological Survey website, Magnitude / Intensity Comparison, 2011.

### **Q9.2 Acronyms**

See the [Base Plan, Section 9.4](#) for the list of acronyms used in this plan.

## **Q10. Attachments**

None.