

Ground Shaking and Damage at Your House

(Internet, Word Processor)

Name _____

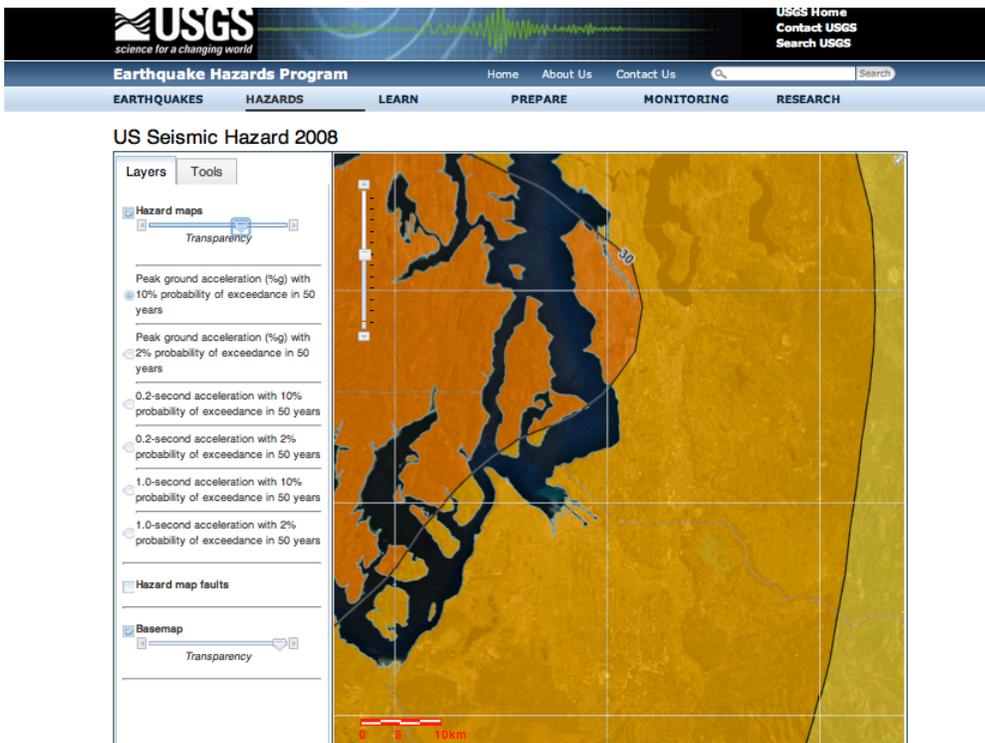
Due Date _____

In this activity, you will assess the general ground shaking hazard from any fault source and potential damage to your home from an earthquake of a certain magnitude.

Earthquakes cause the ground surface to move in many different directions. The change of velocity in the ground surface during shaking is called **acceleration**. Buildings (and people) experience acceleration as a force pushing on them. High accelerations are more damaging to buildings than low accelerations and high accelerations lead to higher intensity of damage at a given location. As a result, engineers are very interested in determining the **peak ground acceleration (PGA)** probable in a location, so they can design structures to withstand the potential shaking. Acceleration values are reported in % of gravity or (%g).

The USGS has created probabilistic seismic hazard maps for all of the United States. An interactive map can be found here:

USGS, 2012, *US Seismic Hazard 2008*, Earthquake Hazards Program, <http://earthquake.usgs.gov/hazards/apps/map>



The website was used to create the map shown in here.

The map uses color to show hard rock peak ground acceleration with 10% probability of exceedance in 50 years.

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Finding Peak Ground Acceleration in Your Area

Go to the interact map at: <http://earthquake.usgs.gov/hazards/apps/map>

Make sure the following layers are selected: Hazard Maps, Base Map, and Peak Ground Acceleration with a 10% Probability of Exceedance in 50 Years.

Zoom in to Washington State, and find the approximate location of your home on the map. You can use the transparency slider to see the base map beneath the colors.

1. What area/neighborhood do you live in? _____
2. What is the (hard rock) peak ground acceleration (PGA) value for where you live?
_____ % g.

Important: The value determined in #2 does not include local effects. It is for people who live on hard rock only. As you know, most of us live on softer soils that amplify seismic shaking. In order to account for the type of soil you live on, you will need to multiply the peak ground acceleration by a factor. Find out what your geologic unit you live on by looking back at Assignment 1.6.

If the geologic map unit is	Multiply the PGA by
M, Qb, Qal, Qw, Af, Afr, G, Rg, Qp, Qyal, Qt, Qom, Qoal	5
A different unit starting with Q	3
A unit that starts with T or K	1
Other	Ask your instructor

3. What geologic unit do you live on?
4. What is the peak ground acceleration with 10% probability of exceedance corrected for the soil conditions at your house? (Multiply the hard rock value by the correct multiplication factor in the table above) _____ % g

5. **What does this mean?** (Fill in the blank here:)

There is a 10% probability that within the next 50 years, an earthquake in this region will create shaking that produces ground acceleration exceeding _____ % g in the area where you live.

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Comparing Ground Acceleration to the Mercalli Intensity Scale

Let's find out what these acceleration values mean to your house in terms of the intensity of shaking and potential damage. Find the Modified Mercalli Intensity Scale. This scale (which runs from I to XII in Roman numerals) relates damage done during earthquakes at different levels of ground shaking. It can roughly be equated to ground acceleration values. Examine the table and answer the following questions.

6. What Modified Mercalli scale intensity does the peak ground acceleration determined in #5 equate to?

7. Summarize the Mercalli Scale description of this shaking:

Potential Damage to Your Home

Maybe you can find out more about the possible damage to your home by looking for information specific to the type of building you live in. The following website provides information on housing types and potential structure damage based on type.

ABAG (Association of Bay Area Governments), 2003, *Impacts of California Earthquakes on Buildings from Shaken Awake*, Online at:

<http://www.abag.ca.gov/bayarea/eqmaps/shelpop/bldg.html>

Read the classification

Click on the type of construction that best describes your home.

Read the description provided.

8. Building type of your home: _____

9. Based on the construction of your home, what structural damage is likely to occur to your home as a result of severe earthquake shaking? Does your home contain any of the weaknesses mentioned in the description? If so, which?

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10. Examine the graph: *Percent Uninhabitable By Intensity Level*. Estimate the percentage of homes (of your building type) that are likely to be uninhabitable after an earthquake of the intensity you found in question 6:

Synthesizing Ground Shaking Information

11. In your Earthquake Hazard and Risk Report, you will be asked to discuss the hazard and risk to you of ground shaking at your home. You now have the scientific data that you need to make this evaluation. Using the information above, **type** at least two paragraphs that **synthesizes** this information for your report. You should have one paragraph where you define the hazard at your house and at least one other paragraph where you describe your potential risk (damage) from the hazard.

Your response should be typed, double-spaced and written in a clear, grammatically correct format. Your paragraphs should be well structured and smooth—with a topic sentence, for instance.

You will be graded on the accuracy, completeness, and level of detail in your response, as well as the quality of your writing. Of course, the sources that you use must have correctly formatted **citations within the text** and correctly formatted **bibliographies for each source**. Don't forget to cite the source of what unit you live on.