STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
JOHN D. BEAULIEU, STATE GEOLOGIST

Earthquake-Induced Slope Instability: Relative Hazard Map
Eastern Portion of the Eola Hills, Polk County, Oregon

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Eastern Portion of the Eola Hills, Polk County Oregon

By R. Jon Hofmeister and Yumei Wang

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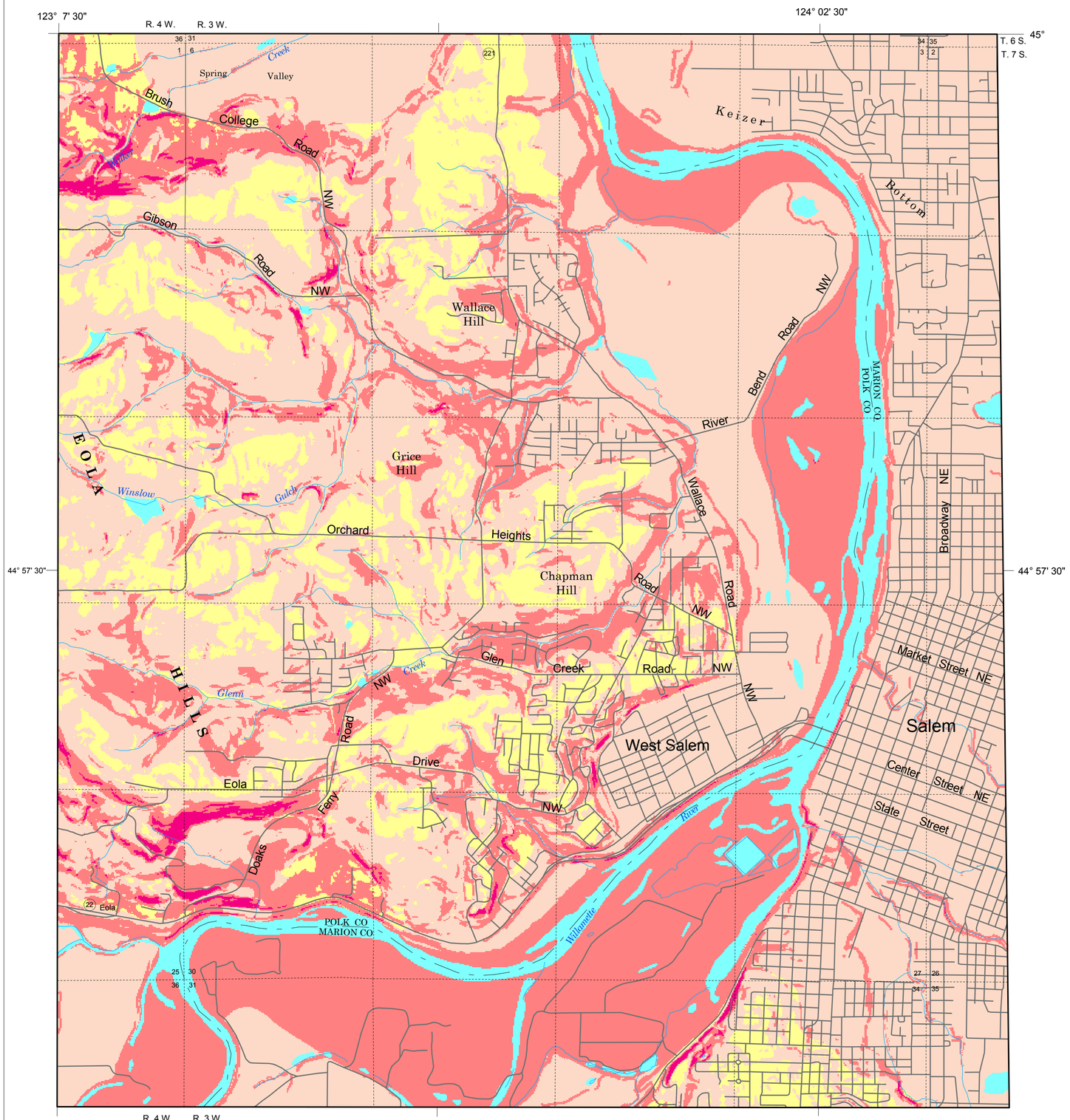

EXPLANATION

Hazard ratings

- High
- Moderate
- Low
- Very low

Please note:
The information provided on this map should NOT be substituted for site-specific geotechnical investigations. The relative hazard ratings are based on regional analyses and are intended for regional applications.

Refer to DOGAMI Special Paper 30 for a detailed discussion of the mapmaking methodologies.

This relative hazard map shows areas that are susceptible to slope failures triggered by earthquake shaking. The map is a composite of steep rock slope, soil slide, and lateral spread hazards. The classes *High* to *Very Low* indicate a range of slope hazard from more prone to less prone to failure from an earthquake event. The higher hazard zones are located along the banks of the Willamette River and in select portions of the Eola Hills.

A relative hazard rating of *High* does not necessarily mean that a slope will fail in any earthquake, and a rating of *Very Low* does not mean that there is no potential for movement. The extent and severity of slope instability depends on the size and location of the actual earthquake event. In a large earthquake event, there may be instability in *Moderate*, *Low*, and *Very Low* zones as well as *High*. For small earthquakes, there may be only slight damage even in *High* zones. In any given earthquake event, though, a higher percentage of earthquake-induced ground failures is expected in *High* zones than in the *Moderate*, *Low* and *Very Low* zones.

Seismic slope instability is a complex function of the severity of ground shaking, slope geometry, and material properties at a site. For this composite map, three modes of slope failure were modeled, using Geographic Information System (GIS) tools as outlined in DOGAMI Special Paper 30. For evaluating steep rock slopes, an empirical decision tree developed by D.K. Keefer in 1993 was implemented, based on field evaluation of rock outcrops in the Salem Hills. Moderate soil slopes were modeled using a simplified Newmark sliding block analysis developed by R.W. Jibson in 1993, taking into account local soil properties and slope geometry. For evaluating lateral spread hazard, an empirical relationship developed by S.F. Bartlett and T.L. Youd in 1995 was used to differentiate relative hazards for recent alluvial deposits. Each failure mode was modeled within a GIS using digital soils, geology, and topographic input data.

Realistic evaluations of relative hazard are vital for planning and development purposes, for emergency response management, as inputs for damage and loss estimations, and in making informed land use decisions. The goal of this project was to produce hazard maps for earthquake-induced landslides to serve as an aid to both specialists and nonspecialists in evaluating relative hazards within two critical Salem areas, the Salem Hills (DOGAMI map IMS-17) and the Eola Hills (this map). These hazard maps are intended to be used in conjunction with other available resources to make informed regional decisions to limit the loss of life and property damage in future earthquake events.

Base map derived from U.S. Geological Survey,
Salem West, OR 7.5' quadrangle
The quadrangle was scanned and converted to vector files by the Engineering Support Unit of the Oregon Department of Corrections

Oregon State Plane Coordinate System, north zone, NAD 27

Scale 1:24,000

0 ½ 1 Mile
0 1 2 Kilometers

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Location Map

By R. Jon Hofmeister and Yumei Wang,
Oregon Department of Geology and Mineral Industries

This map is available from:
The Nature of the Northwest Information Center
800 NE Oregon Street #5
Portland, OR 97232
503/872-2750 www.naturenw.org
and the Baker City and Grants Pass, Oregon field offices
of the Oregon Department of Geology and Mineral Industries