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Preparation of a Guide to Using Relative Earthquake Hazard Maps for Mitigating Seismic Risk in the Portland Metropolitan Area: Collaborative Research with Metro and Spangle Associates

Element II

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PREPARATION OF A GUIDE TO USING RELATIVE EARTHQUAKE HAZARD MAPS FOR MITIGATING SEISMIC RISK IN THE PORTLAND METROPOLITAN AREA: COLLABORATIVE RESEARCH WITH METRO AND SPANGLE ASSOCIATES

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Technical Abstract
This is a collaborative project for Phase II of a project funded by the USGS in FY 1994 (USGS 1434-94-G-2448). Phase I recommended general planning policies, land uses and geologic investigation requirements based on earthquake hazard maps prepared by the Oregon Department of Geology and Mineral Industries (DOGAMI) with support from the U.S. Geological Survey. The maps, prepared for each quadrangle in the Portland metropolitan region, include maps of three individual earthquake hazards: liquefaction, landslides, and ground motion amplification as well as a composite map combining information from the other three. In Phase II, a project team consisting of planners, a structural engineer and an engineering geologist detailed the recommendations and prepared a guidebook for local governments in the Portland metropolitan region explaining how to use the maps to guide land use and development decisions in the region.

The team drafted the guidebook, submitted copies to state, regional and local officials for review, and met to review the draft with the Metro Natural Hazards Technical Advisory Committee (HAZTAC). The guidebook was revised based on comments and suggestions from reviewers and formatted for publication. A team member visited the region in September 1998 to take photographs to illustrate the examples in the guidebook and go over final comments with key local, state and regional officials. The guidebook was published in October by Metro and was distributed at the Regional Natural Hazard Mitigation Plan Workshop held in Portland on October 30, 1998. Additional distribution of the report will be made to Oregon government officials and other researchers with an interest in information transfer.

The guidebook, *Using Earthquake Hazard Maps: A Guide for Local Governments in the Portland Metropolitan Region*, is available from Metro, 600 NE Grand Avenue, Portland, Oregon 97232. It describes the maps; state programs regarding comprehensive planning, building regulation, and emergency management; and regional growth management and hazard mitigation planning. The state and regional programs provide the context for local use of the maps. The main body of the guidebook discusses how local governments can use the maps for the following activities:

- comprehensive planning and zoning
- review of subdivision applications
- site-specific seismic hazard evaluations
- planning, siting and designing of public facilities and utilities
- redevelopment and seismic retrofit
- emergency management

The report lists guidelines for each type of application and describes examples from the Portland region of how the maps have been used or could be used for each application. The examples are illustrated with photographs and, where appropriate, colored maps.

Non-Technical Summary

This is a collaborative project with Metro, the regional government for the Portland metropolitan area to produce a guidebook for local governments on the use of earthquake hazard maps prepared for each quadrangle in the region with support by USGS. The guidebook, illustrated with photographs and colored maps, describes the maps and state and regional programs that influence local government use of the maps. The main body of the guidebook describes, with specific examples, how local governments can use the maps for comprehensive planning and zoning, review of subdivision applications, site-specific seismic hazard evaluations, planning, siting and designing of public facilities and utilities, redevelopment and seismic retrofit, and emergency management.

Background

In FY 1994, USGS awarded a grant to Spangle Associates and Metro for a collaborative project, *Model Land Use and Development Regulations for Mitigating Seismic Risks in the Portland Metropolitan Area* (1434-94-G-2448). The purpose of the project was to explore how local governments could use earthquake hazard maps in regulating land use and development. Earthquake hazard maps were being prepared for the region by the Oregon Department of Geology and Mineral Industries (DOGAMI). At the time of this initial study, maps showing amplified ground shaking, liquefaction potential and landslide susceptibility had been completed for the Portland quadrangle. In addition, a composite map of the three hazard maps, called the Relative Earthquake Hazard Map (REHM), had been prepared. Three other quadrangles were being mapped and plans were in place to map the entire region.

The project was conducted by urban planners George Mader and Martha Blair Tyler of Spangle Associates, and O. Gerald Uba of Metro with assistance from subcontractors John Martin, a geotechnical engineer with Dames & Moore, and Frank C. McClure, a consulting structural engineer. In the course of this project, Metro established the Metro Advisory Committee on Mitigating Earthquake Damage (MACMED) specifically to advise the project team. MACMED was composed of representatives of local governments, state agencies, utilities and private entities with an interest in earthquake hazard mitigation. During the project term, the team grouped land uses in the Portland region according to their seismic vulnerability and created matrices indicating the acceptability of each land use category in each hazard zone on the earthquake hazard maps. The results were reported in a Phase I draft report, *Using Earthquake Hazard Maps for Land Use Planning*, completed in October 1994. Over several months, MACMED reviewed the draft report, making numerous modifications to reflect a growing political consensus about the use of the maps for planning. In January 1996, long after the close of the USGS project, MACMED adopted its version of the report, *Using Earthquake Hazard Maps for Land Use Planning and Building Permit Administration*.

From the beginning, the original project had been viewed as Phase I of a larger effort to provide effective guidance to local governments in the uses of the earthquake hazard maps for land use and development regulation. In FY 97, USGS funded Phase II, *Preparation of a Guide to Using Relative Earthquake Hazard Maps for Mitigating Seismic Risk in the Portland Metropolitan Area: Collaborative Research with Metro and Spangle Associates* (1434-HQ-97-GR-03159). The principal investigators were O. Gerald Uba for Metro and George G. Mader for Spangle Associates. They were assisted by Martha Blair Tyler with Spangle Associates; William Cole and William Cotton, engineering geologists with Cotton, Shires & Associates; and Frank C. McClure, consulting structural engineer.

The project was designed to build on and elaborate the guidance produced in Phase I. The overall objective was to foster effective application of the earthquake hazard maps to reduce the region's vulnerability to earthquakes. Specifically, the objectives were:

- To develop and evaluate a guide to uses of the relative earthquake hazard maps by public and private entities.

- To develop and evaluate model land use and development regulations based on land use/hazard zone correlations developed during Phase I of the project and adopted by MACMED.

- To encourage implementation of regulations and hazard mitigation measures through technical assistance and a workshop for local officials.

Between the time the proposal was written and the project funded, MACMED had been disbanded. In its place, Metro formed the Natural Hazards Technical Advisory Committee (HAZTAC) to oversee all its activities related to natural hazards. The committee included a few of the former MACMED members, but lacked representation from the planning community and had fewer members from local governments. Although HAZTAC reviewed and unanimously approved a draft of the guidebook, the committee was less actively involved in the project than MACMED was in the Phase I effort.

Also, after completing the proposal to USGS, Spangle Associates was approached by FEMA to conduct an evaluation of the use of the earthquake hazard maps in the Portland region. The means of coordinating the two projects were discussed at a meeting in Portland on November 19, 1996. Those attending included Craig Weaver, USGS, Art Zeizel, FEMA and representatives of DOGAMI, the Oregon Office of Emergency Management, Metro and the City of Portland. It was decided to conduct the projects in sequence starting with an initial survey and round of interviews for the FEMA project, proceeding with drafting the guidebook for USGS, and concluding with a final survey and interviews for FEMA. This sequence would allow information from the initial survey and interviews to be used to develop local examples of uses of the maps for the guidebook. In turn, interviewing done for the guidebook could be used to identify additional uses for the FEMA evaluation. In this way, the projects could be kept discrete, but each could benefit from information gathered for the other.

Research

Work on the project started with research on the Oregon system of comprehensive planning and land use regulation. Then, in November 1997, George Mader and Martha Tyler scheduled and conducted a series of meetings in Oregon to obtain background information to define potential applications for the earthquake hazard maps and to explore examples of uses of the maps. Meetings were held with representatives from state agencies, Metro, and several local governments. The local governments were selected on the basis of our prior work in the region and also from responses to the first questionnaire sent out for the FEMA evaluation project. Agencies included were:

Oregon Department of Land Conservation and Development
Oregon Department of Geology and Mineral Industries
Oregon Office of Emergency Management
Oregon Department of State Lands
Oregon Seismic Safety Policy Advisory Committee
Metro Growth Management Services Department
Clackamas County
City of Lake Oswego
City of Portland

On the basis of the Oregon meetings, the team made the following decisions about the content of the guidebook to:

- The guidebook should focus on uses of the maps by local governments. Separate guidebooks should eventually be done for specific private sector users.

- The guidebook should describe a full range of local government uses rather than be limited to land use planning applications.

- The guidebook should contain examples of use from the Portland metropolitan area whenever possible. When local examples are not available, the guidebook should describe the application using a real local situation and describing how the maps might be used.

- The guidebook should contain detailed guidance about programs to require seismic hazard evaluations prior to issuing development approvals in areas shown as hazardous on the maps.

With these decisions as a guide, a rough draft was assembled and discussed at a project team meeting in February 1998. Team members contributed comments and suggestions and William Cole, Cotton, Shires & Associates, agreed to provide additional material on requiring geotechnical investigations. The draft was reworked and completed, drawing from the team comments and many additional telephone contacts with state and local governments in Oregon to describe and illustrate the examples. Copies of the draft material on the examples were forwarded to the major sources for the information for review and comment. This process and the follow-up telephone contacts became the primary means of evaluating the accuracy, relevance and usefulness of the guidebook as work proceeded.

A near-final draft was forwarded to HAZTAC for consideration at its April 1998 meeting. Martha Tyler presented the draft. The response of HAZTAC members was uniformly positive and virtually no changes were suggested. Attention turned to the layout of the publication and finding appropriate illustrations for the examples. In September 1998, Martha Tyler returned to the Portland area to take photographs to illustrate the examples and check some final details of the descriptions.

The guidebook describes the maps; state programs regarding comprehensive planning, building regulation, and emergency management; and regional growth management and hazard mitigation planning. The state and regional programs provide the context for local use of the maps. The main body of the guidebook discusses how local governments can use the maps for the following activities:

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Publication and Distribution

The guidebook, *Using Earthquake Hazard Maps: A Guide for Local Governments in the Portland Metropolitan Region*, was published by Metro in October 1998 and is available from Metro, 600 NE Grand Avenue, Portland, Oregon 97232. It was presented by Martha Tyler at the Natural Hazard Mitigation Plan Workshop held on October 3, 1998 in Portland. Between 50 and 60 people attended the all-day workshop—about half of them representing a city or county government. All participants received copies of the guidebook. Since then, copies have been sent by Metro to all local governments in the region. Copies will also be sent to researchers and others engaged in information transfer. DOGAMI has expressed interest in publishing the guidebook as an open-file report and distributing it throughout the state. Five copies of the guidebook are being forwarded to USGS by Metro.