

LATERAL SPREAD DISPLACEMENT AND DYNAMIC SLOPE INSTABILITY MAP, PORTLAND QUADRANGLE,  
MULTNOMAH AND WASHINGTON COUNTIES, OREGON, AND CLARK COUNTY, WASHINGTON  
1993

GMS-79

Earthquake Hazard Maps of the Portland Quadrangle,  
Multnomah and Washington Counties, Oregon,  
and Clark County, Washington  
By M.A. Mabey and others  
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PLATE 3

ESTIMATED LATERAL GROUND DISPLACEMENTS  
FOR THE FOLLOWING CONDITIONS:

Earthquake magnitude,  $M_w = 8.5$   
Distance to seismic source,  $R = 100$  km (60 mi)  
Sediment type SM (fines content = 30%,  $D_{50} = 0.2$  mm)

- 0.3 to 0.6 meters (1 to 2 feet)
- 0.6 to 0.9 meters (2 to 3 feet)
- 0.9 to 1.2 meters (3 to 4 feet)
- More than 1.2 meters (4 feet)

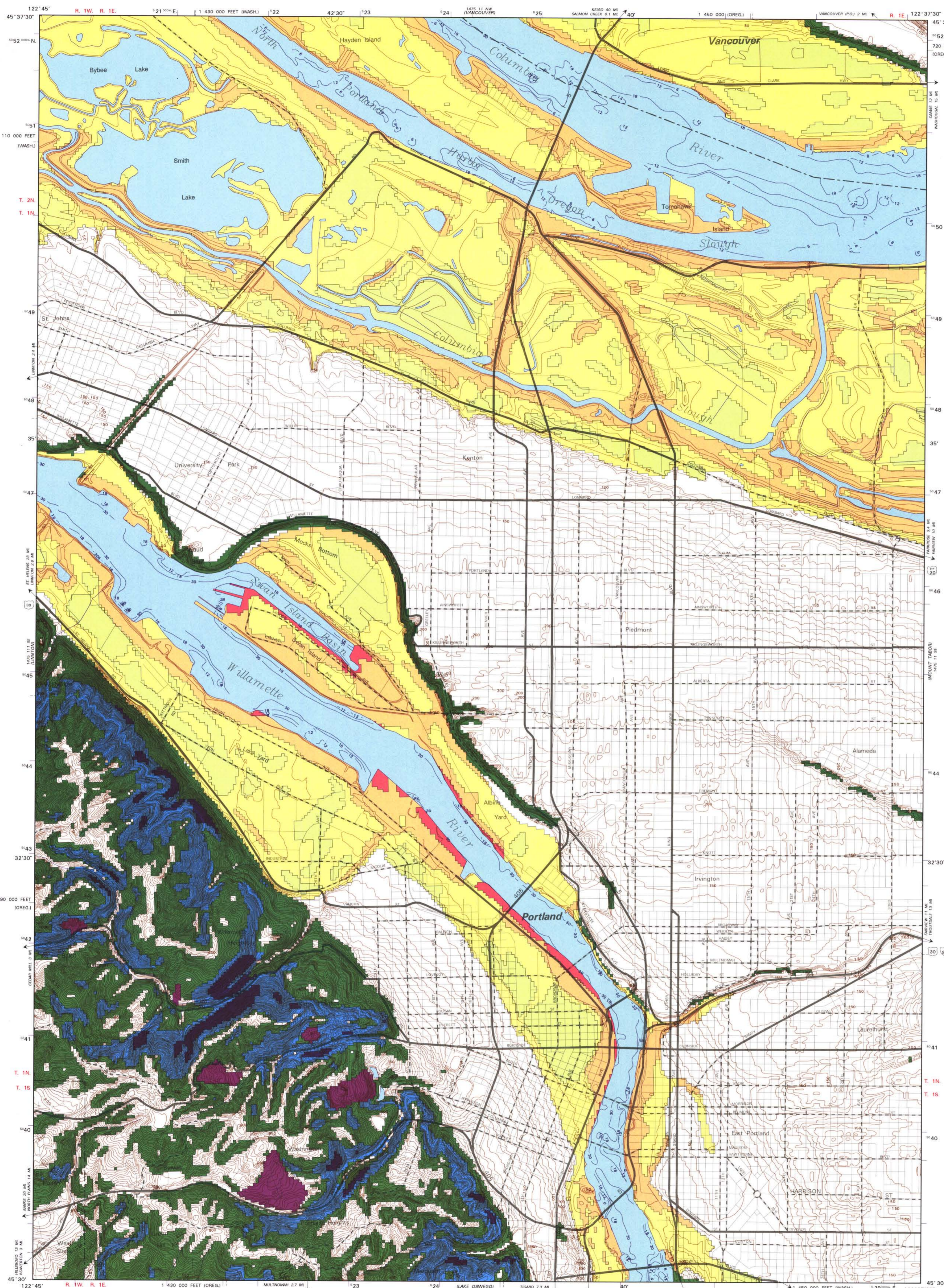
To adjust Estimated displacements for other seismic and sediment conditions, multiply the values listed above by appropriate factors from the tabulation below:

Unified Soil Classification	Fines Content $F_{15}$ %	Mean Grain Size $D_{50}$ mm	Multiplication Factor
SP or SW - poorly- to well-graded fine sand	<5	<0.4	3
SP or SW - poorly- to well-graded coarse sand	<5	>0.7	1.5
SP-SM or SW-SM - poorly- to well-graded fine sand with silt	5 - 12	<0.4	2.5
SP-SM or SW-SM - poorly- to well-graded coarse sand with silt	5 - 12	>0.7	1.5
SM - silty fine sand	12 - 30	<0.4	2
SM - silty coarse sand	12 - 30	>0.7	1
SM - very silty sand	30 - 50	<0.4	1
ML - sandy silt	50 - 70	<0.08	0.3
To adjust values for $M = 6.5$ earthquake at $R = 10$ km			0.6
To adjust values for high probability of non-exceedance			2

RELATIVE DYNAMIC SLOPE INSTABILITY

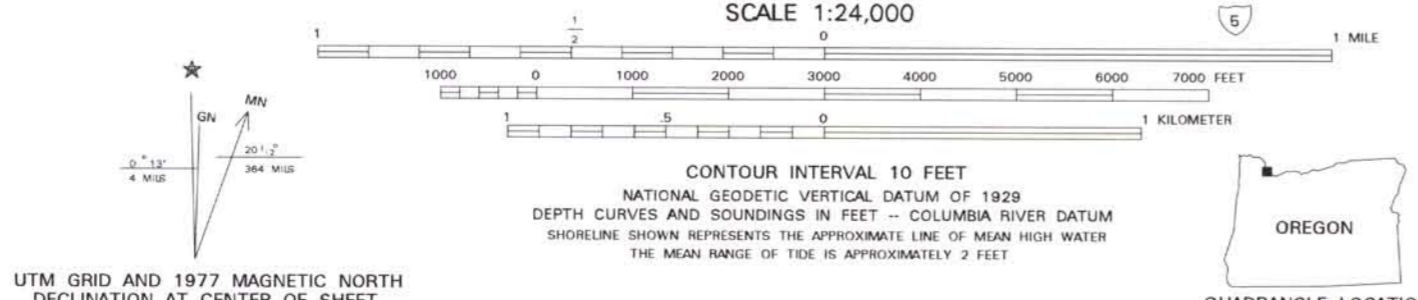
- Ground slope greater than or equal to 15%
- Factor of safety between 2 and 1.25
- Factor of safety less than 1.25
- Existing landslide

White area implies <0.3m liquefaction displacement, factor of safety >2, and slopes <15%



Digital base map modified from U.S. Geological Survey Control by USGS, NOS/NOAA, and State of Oregon. Topography from aerial photographs by photogrammetric methods and by planimetric surveys. Culture and drainage in part by USGS Aerial photographs taken 1951. Field checked 1954. Revised from aerial photographs taken 1960. Field checked 1961.

Polyconic projection, 1927 North American datum  
10,000-foot grids based on Oregon coordinate system, north zone and Washington coordinate system, south zone  
1000-meter Universal Mercator grid ticks, zone 10



Liquefaction analysis by T.L. Youd and C.F. Jones, Brigham Young University  
Dynamic slope stability analysis by M.A. Mabey and I.P. Madin, Oregon Department of Geology and Mineral Industries  
Cartography by L.D. Freeman, Metro

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