STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
DONALD A. HULL, STATE GEOLOGIST

Tsunami Hazard Map of the Warrenton Area, Clatsop County, Oregon

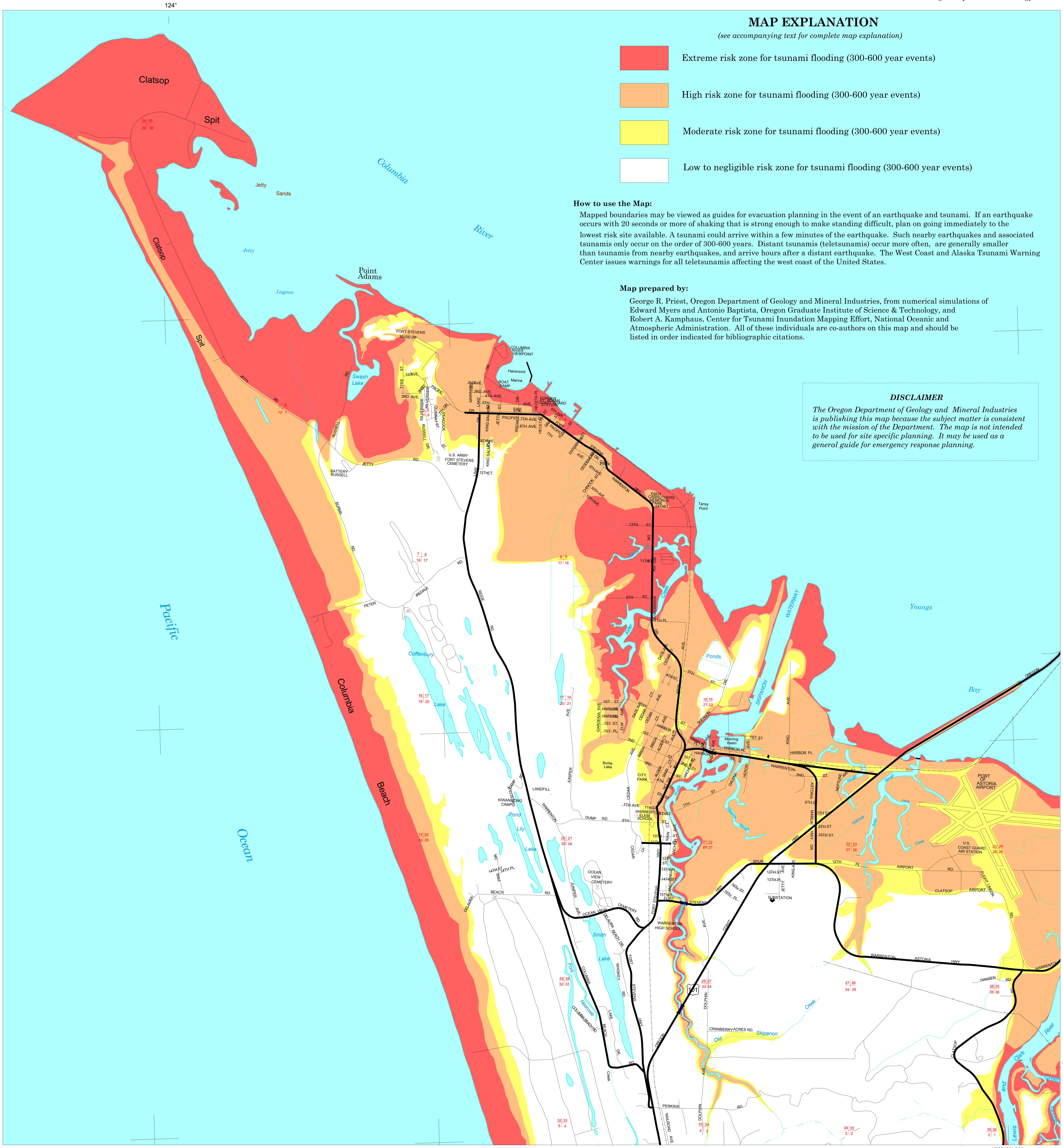
1999

IMS-12

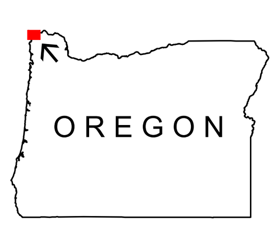
Tsunami Hazard Map of the Warrenton Area, Clatsop County, Oregon

By G.R. Priest and others

Funded by Federal Emergency Management Agency Cooperative Agreement Number EMS-97-CA-0058 (from funds originally given to the National Oceanic and Atmospheric Administration for tsunami hazard mitigation) and the Oregon Department of Geology and Mineral Industries



Base map modified from Oregon Department of Transportation, City Map Series, Warrenton digital file
Universal Transverse Mercator projection
NAD 1927, NAVD 29
Public Land Survey System shown with red ticks and associated section numbers



Location Map

Scale 1:24,000

0 0.5 1 Mile

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

State of Oregon
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John D. Beaulieu, State Geologist

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How to Use the Map

Mapped boundaries may be viewed as guides for evacuation planning in the event of an earthquake and tsunami. *If an earthquake occurs with 20 seconds or more of shaking that is strong enough to make standing difficult, plan on going immediately to the lowest risk site available. A tsunami could arrive within a few minutes of the earthquake.* Such nearby earthquakes and associated tsunamis occur in intervals of approximately 300–600 years. Distant tsunamis (teletsunamis) occur more often, are generally smaller than tsunamis from nearby earthquakes, and arrive hours after a distant earthquake. The West Coast and Alaska Tsunami Warning Center issues warnings for all teletsunamis affecting the West Coast of the United States.

Map Hazard Categories

White — **Low to negligible risk zone for tsunami flooding (300- to 600-year events)**

Yellow — **Moderate risk zone for tsunami flooding (300- to 600-year events)**

Elevations within and below this zone would be flooded by a Cascadia subduction zone tsunami from a magnitude 9.1 earthquake with doubling of the fault slip immediately offshore. See “Model 1A Asperity” in Priest and others (1997) for a complete explanation of this model earthquake and tsunami.

Orange — **High risk zone for tsunami flooding (300- to 600-year events)**

Elevations within and below this zone would be flooded by a Cascadia subduction zone tsunami from a magnitude 9.1 earthquake. See “Model 1A” in Priest and others (1997) for a complete explanation of this model earthquake and tsunami.

Red — **Extreme risk zone for tsunami flooding (300- to 600-year events)**

Elevations within and below this zone would be flooded by a Cascadia subduction zone tsunami from a magnitude 8.6 earthquake. See “Model 2Cn” in Priest and others (1997) for a complete explanation of this model earthquake and tsunami.

The following figures illustrate timing of waves as they arrive after a large earthquake on the nearby Cascadia subduction zone fault system. Figures 1 and 2 illustrate the sequence of water elevation changes from tsunamis arriving after a subduction zone earthquake. See “Model 1A” in Priest and others (1997) for a complete explanation of this model earthquake and tsunami. Figure 3 shows the expected changes in current direction and speed in the shipping channel for the worst-case scenario tsunami. See “Model 1A, Asperity” in Priest and others (1997), for a complete explanation of this model earthquake and tsunami.

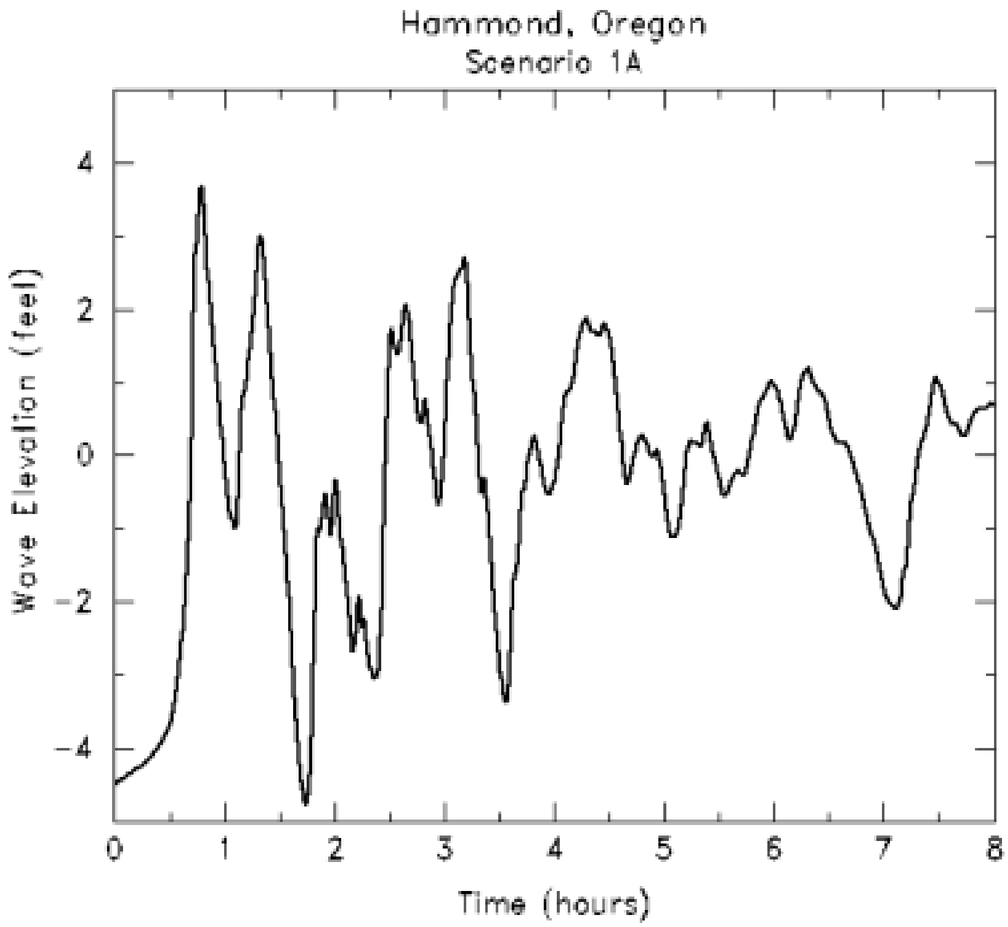

Figure 1. Time history of wave arrivals at Astoria after a magnitude 9.1 earthquake on the nearby Cascadia subduction zone fault system. Negative wave elevations correspond to surges of water heading seaward; positive elevations correspond to surges up the estuary channels. Observation point is immediately offshore from the Hammond boat basin. Note that the first major surge of flooding does not strike this area until about 45 minutes after the earthquake; however, expect some flooding immediately after the earthquake in response to 3–6 ft of local subsidence of the land. Current direction in the estuary channels could be either seaward or landward during the first 30 minutes after the earthquake, depending on how the fault rupture process occurs. Actual tsunami wave elevation at shoreline sites will be higher than shown on the diagram. This illustration should be used to understand approximate timing and relative wave elevation, not absolute wave elevation at the shoreline. It is based on a moderately high tsunami run-up scenario (Model 1A in Priest and others, 1997).

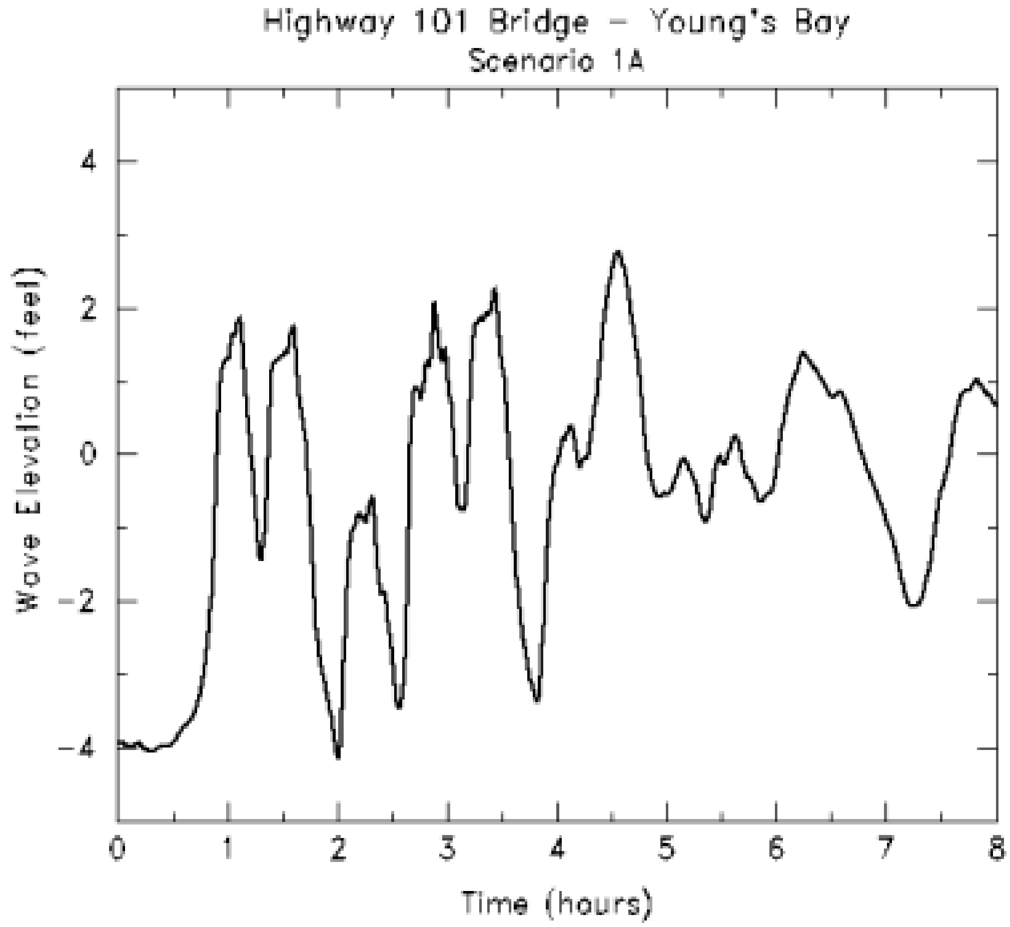

Figure 2. Time history for same tsunami scenario as in Figure 1 but for wave arrival in Youngs Bay at the Highway 101 bridge. Negative wave elevations correspond to surges of water heading seaward; positive elevations correspond to surges up the estuary channels. Observation point is immediately offshore from the main docks north of the Columbia River bridge. Note that the first major surge of flooding does not strike this area until about 1 hour after the earthquake; however, expect some flooding immediately after the earthquake in response to 3–6 ft of local subsidence of the land. Current direction in the estuary channels could be either seaward or landward during the first 30 minutes after the earthquake, depending on how the fault rupture process occurs. Actual tsunami wave elevation at shoreline sites will be higher than shown in the diagram. This illustration should be used to understand approximate timing and relative wave elevation, not absolute wave elevation at the shoreline.

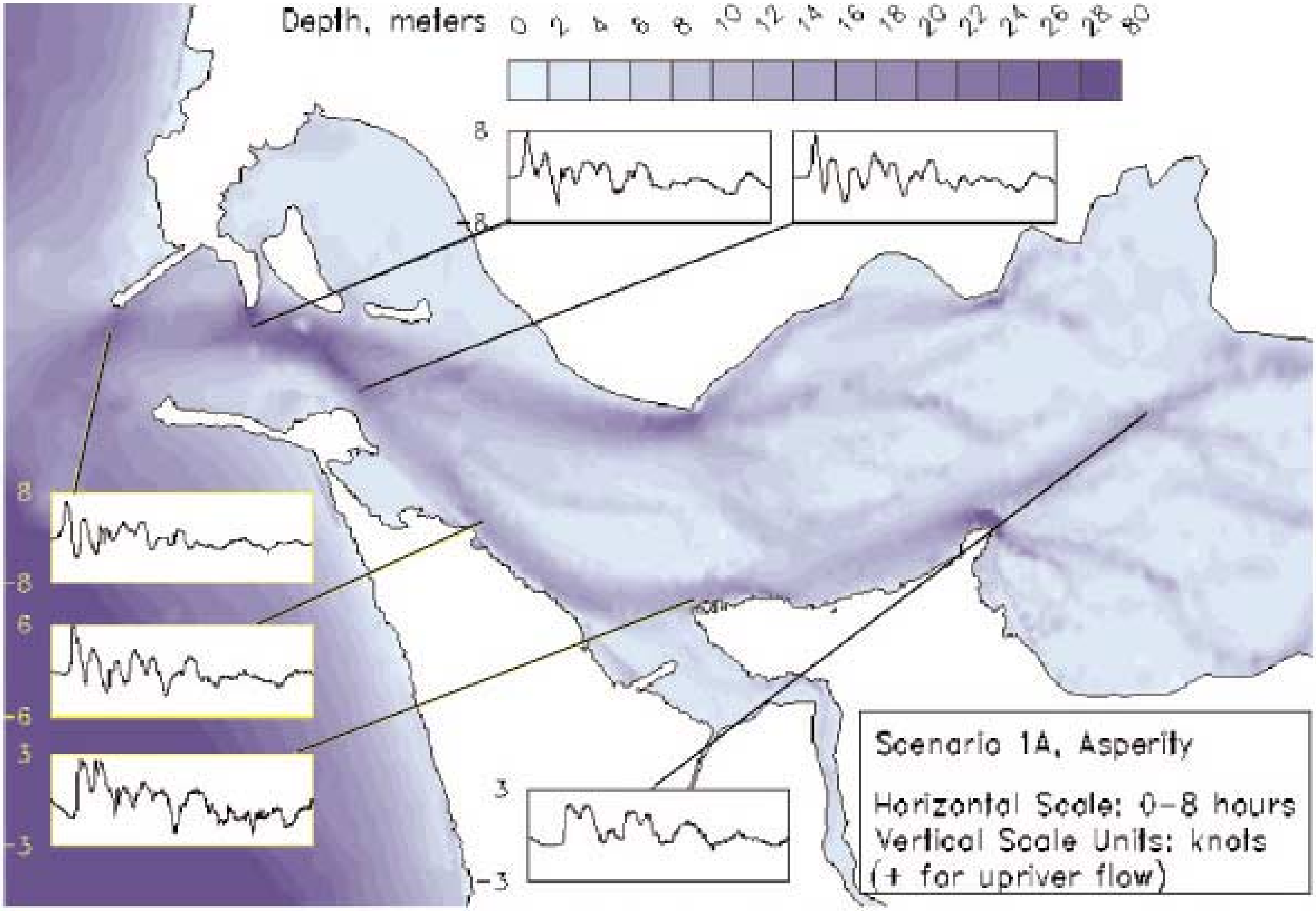

Figure 3. Estimated tsunami-induced velocities from one hypothetical case; it does not characterize the tsunami-related currents from all possible tsunamis. Tsunami-induced velocities of at least 3–8 knots above and beyond normal tidal and river-induced velocities should be considered in preparing for the impact of a Cascadia subduction zone earthquake in the estuary. Tsunami-induced high velocities may persist for several hours, with sharp changes in direction. Maximum velocities, persistence, and timing of changes in current direction will depend dramatically on the earthquake that generated the tsunami and the tidal and river conditions.

When planning evacuation routes and destinations, check with local officials for guidance. In general, one should go to the least hazardous site (noncolored area or the coolest color on the map) by the shortest route, making sure that the route is not compromised by other earthquake hazards such as liquefaction or earthquake-induced landslides. Bridges may fail in the event of an earthquake. Consult with transportation authorities about the seismic stability of bridges used for evacuation.

Additional Detailed Information

See Oregon Department of Geology and Mineral Industries Open-File Report O–97–34 (Priest and others, 1997) for a detailed explanation of the mapping techniques.

Funding Source

Funds for the project were primarily from Federal Emergency Management Agency Cooperative Agreement Number EMS–97–CA–0058 from funds originally given to the National Oceanic and Atmospheric Administration for tsunami hazard mitigation. Funds were also provided by the Oregon Department of Geology and Mineral Industries.

Reference Cited

Priest, G.R., Myers, E., Baptista, A., Fleuck, P., Wang, K., Kamphaus R.A., and Peterson, C.D., 1997, Cascadia subduction zone tsunamis: Hazard mapping at Yaquina Bay, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O–97–34, 144 p.

Note

The Oregon Department of Geology and Mineral Industries is publishing this map because the information furthers the mission of the Department. The map is not intended to be used for site-specific planning. It may be used as a general guide for emergency-response planning.