

Complete Report for Bolton Fault (Class B) No. 874

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U.S. Geological Survey website,
<http://earthquakes.usgs.gov/regional/qfaults>, accessed 01/23/2012
07:21 PM.

Synopsis	The northwest-striking Bolton fault forms a prominent (150-m-high), northeast-facing escarpment in volcanic rocks of the Miocene Columbia River Basalt Group in the northern Willamette Valley. The fault is part of the Portland Hills-Clackamas River structural zone. The fault is probably a southwest-dipping reverse fault with down-to-the-northeast separation of about 200 m in Miocene volcanic rocks. No fault scarps on surficial deposits, or other unequivocal evidence of Quaternary displacement has been described, so herein the fault is classified as Class B until further studies are conducted.
Name comments	<p>The Bolton fault was first mapped in part by Hammond and others (1974 #4050) and Schlicker and Finlayson (1979 #4166), and was mapped in detail and presumably named after the town of Bolton by Beeson and others (1989 #4047) and Madin (1990 #4067); the southern part of the fault has been mapped by Schlicker and Finlayson (1979 #4166), Burns and others (1997 #4079), and Gannett and Caldwell (1998 #4066). The fault may be part of the Portland Hills-Clackamas River structural zone of Beeson and others (1985 #4022; 1989 #4023), and is included in the Portland Hills fault zone of Blakely and others (1995 #4021).</p> <p>Fault ID Comments: This structure is fault number 27 of Geomatrix Consultants, Inc. (1995 #3593).</p>
County(s) and State(s)	CLACKAMAS COUNTY, OREGON
AMS sheet(s)	Vancouver
Physiographic province(s)	PACIFIC BORDER
Reliability of location	<p>Good Compiled at 1:100,000 scale.</p> <p><i>Comments:</i> The fault trace is from 1:24,000-scale mapping of Beeson and others (1989 #4047) and Madin (1990 #4067), supplemented with 1:100,000-scale mapping of Burns and others (1997 #4079), and 1:250,000-scale mapping of Gannett and Caldwell (1998 #4066).</p>
Geologic setting	The northwest-striking Bolton fault forms a prominent northeast-facing escarpment in volcanic rocks of the Miocene Columbia River Basalt Group in the northern Willamette Valley (Beeson and others, 1989 #4047). The fault is part of the Portland Hills-Clackamas River structural zone of Beeson and others (1989 #4023), and the Portland Hills fault zone of Blakely and others (1995 #4021).
Length (km)	9 km.
Average strike	N53°W
Sense of movement	<p>Reverse</p> <p><i>Comments:</i> The available sense-of-movement and dip-direction data are somewhat contradictory. The Bolton fault is mapped as a high-angle, east-dipping normal fault by Schlicker and Finlayson (1979 #4166) and Beeson and others (1989 #4047), but the fault is also modeled as a 70° east-dipping reverse fault in the earthquake hazards analysis of Geomatrix Consultants, Inc. (1995 #3593) and Wong and others (1999 #4073; 2000 #5137). Geologic relations are inconsistent with the latter geometry. Blakely and others (1995 #4021) describe an exposure of the Bolton fault south of Lake Oswego where slickensides and stratigraphic relations indicate west-side-up (southwest-dipping) reverse faulting with a strike-slip component. Southwest-dipping reverse displacement with a right-lateral strike-slip component is consistent with the tectonic setting, mapped geologic relations, and microseismicity in the area (Beeson and others, 1989 #4047; Yelin and Patton, 1991 #4020; Blakely and others, 1995 #4021).</p>
Dip	

Comments: Schlicker and Finlayson (1979 #4166) and Beeson and others (1989 #4047) show the Bolton fault dipping moderately to steeply northeast. Dip direction data from Geomatrix Consultants, Inc. (1995 #3593) and Wong and others (1999 #4073; 2000 #5137) are contradictory: they modeled the Bolton fault as a 70° northeast-dipping reverse fault, but a northeasterly dip direction is inconsistent with geologic mapping relations of Beeson and others (1989 #4047).

Paleoseismology studies

Geomorphic expression

The Bolton fault forms a prominent, 150-m-high northeast-facing escarpment in volcanic rocks of the Miocene Columbia River Basalt Group along the western margin of the Willamette Valley (Beeson and others, 1989 #4047). Unruh and others (1994 #3597) conducted aerial and field reconnaissance and found no unequivocal evidence of fault scarps on Quaternary deposits along the Bolton and related faults. Given the lack of documented geomorphic expression in Quaternary deposits, herein we classify the fault as Class B until further studies are conducted.

Age of faulted surficial deposits

The Bolton fault offsets Miocene Columbia River Basalt Group volcanic rocks (Schlicker and Finlayson, 1979 #4166; Beeson and others, 1989 #4047). No fault scarps on surficial Quaternary deposits have been described along the fault trace (Unruh and others, 1994 #3597). However, the mapping and cross sections of Beeson and others (1989 #4047) are somewhat contradictory: their map shows the Bolton and related faults as either juxtaposing late Quaternary sediments against Miocene bedrock or as concealed beneath these sediments, but their cross sections show most concealed faults on the map as cutting Quaternary sediments to the surface. This discrepancy reflects drafting errors in the construction of the cross sections (I.P. Madin, pers. commun., 2000).

Historic earthquake

Most recent prehistoric deformation

Quaternary (<1.6 Ma)

Comments: Pezzopane (1993 #3544) mapped the Bolton fault as active in the Quaternary (<1.6 Ma). Geomatrix Consultants, Inc. (1995 #3593), and Madin and Mabey (1996 #3575) mapped parts of the fault as active in the middle and late Quaternary (<780 ka) and other parts as active in the Quaternary (<1.6-1.8 Ma). Unruh and others (1994 #3597) found no unequivocal evidence of Quaternary displacement, but concluded that the fault was potentially active, based on the presence of a prominent bedrock escarpment along the trace of the fault. Wong and others (1999 #4073; 2000 #5137) considered the Bolton fault as a potentially seismogenic structure. Given the lack of documented geomorphic expression in Quaternary deposits, herein we classify the fault as Class B until further studies are conducted.

Recurrence interval

Slip-rate category

Less than 0.2 mm/yr

Comments: No detailed slip rate data have been published. Cross sections from Beeson and others [(1989 #4047) suggest about 200 m of down-to-the-east separation of Miocene Columbia River Basalt Group volcanic rocks across the Bolton and related faults (Unruh and others, 1994 #3597); such data indicate low rates of long-term slip. Geomatrix Consultants, Inc. (1995 #3593) and Wong and others (1999 #4073; 2000 #5137) used estimated slip rates of 0.005-0.05 mm/yr in their analyses of the earthquake hazards associated with the Bolton fault.

Date and Compiler(s)

2002
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