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Quaternary Fault and Fold Database of the United States

As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.

Bolton fault (Class B) No. 874

Last Review Date: 2002-05-24

citation for this record: **Personius, S.F., compiler, 2002, Fault number 874, Bolton fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 03:14 PM.**

Synopsis	The northwest-striking Bolton fault forms a prominent (150-m-high), northeast-fa 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 Riv structural zone. The fault is probably a southwest-dipping reverse fault with dow the-northeast separation of about 200 m in Miocene volcanic rocks. No fault scar surficial deposits, or other unequivocal evidence of Quaternary displacement has described, so herein the fault is classified as Class B until further studies are cond
Name comments	The Bolton fault was first mapped in part by Hammond and others (1974 #4050) 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 (1 #4067); the southern part of the fault has been mapped by Schlicker and Finlayso (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 zo Beeson and others (1985 #4022; 1989 #4023), and is included in the Portland Hil fault zone of Blakely and others (1995 #4021).

	Fault ID: This structure is fault number 27 of Geomatrix Consultants, Inc. (1995 #3593).
County(s) and State(s)	CLACKAMAS COUNTY, OREGON
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:24,000 and 1:50,000 scale. *Comments:* Location of fault from ORActiveFaults (http://www.oregongeology.org/arcgis/rest/services/Public/ORActiveFaults/MapS downloaded 06/02/2016) attributed to Madin (2004 #7877, 2009 #7780).
Geologic setting	The northwest-striking Bolton fault forms a prominent northeast-facing escarpme 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 Portla Hills-Clackamas River structural zone of Beeson and others (1989 #4023), and th Portland Hills fault zone of Blakely and others (1995 #4021).
Length (km)	9 km.
Average strike	N53°W
Sense of movement	Reverse, Right lateral *Comments:* The published sense-of-movement and dip-direction data are somewh contradictory. The Bolton fault is mapped as a high-angle, east-dipping normal fa Schlicker and Finlayson (1979 #4166) and Beeson and others (1989 #4047), but t 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 (199 #4073; 2000 #5137). Geologic relations are inconsistent with the latter geometry. Blakely and others (1995 #4021) describe an exposure of the Bolton fault south o Lake Oswego where slickensides and stratigraphic relations indicate west-side-up (southwest-dipping) reverse faulting with a strike-slip component. Southwest-dip reverse displacement with a right-lateral strike-slip component is consistent with tectonic setting, mapped geologic relations, and microseismicity in the area (Bees and others, 1989 #4047; Yelin and Patton, 1991 #4020; Blakely and others, 1995 #4021).
Dip Direction	SW *Comments:* Schlicker and Finlayson (1979 #4166) and Beeson and others (1989 #4047) show the Bolton fault dipping moderately to steeply northeast. Dip directi

	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 w 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 m of the Willamette Valley (Beeson and others, 1989 #4047). Unruh and others (19 #3597) conducted aerial and field reconnaissance and found no unequivocal evid of fault scarps on Quaternary deposits along the Bolton and related faults. Given lack of documented geomorphic expression in Quaternary deposits, herein we cla 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 Be and others (1989 #4047) are somewhat contradictory: their map shows the Bolto related faults as either juxtaposing late Quaternary sediments against Miocene be or as concealed beneath these sediments, but their cross sections show most conc faults on the map as cutting Quaternary sediments to the surface. This discrepanc reflects drafting errors in the construction of the cross sections (I.P. Madin, pers. commun., 2000).
Historic earthquake	
Most recent prehistoric deformation	undifferentiated 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). and others (1994 #3597) found no unequivocal evidence of Quaternary displacem 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 (199 #4073; 2000 #5137) considered the Bolton fault as a potentially seismogenic stru Given the lack of documented geomorphic expression in Quaternary deposits, he we classify the fault as Class B until further studies are conducted.
Recurrence	

interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Cross sections from Beeson and others [(1989 #4047) suggest about 2 of down-to-the-east separation of Miocene Columbia River Basalt Group volcani rocks across the Bolton and related faults (Unruh and others, 1994 #3597); such d indicate low rates of long-term slip. Geomatrix Consultants, Inc. (1995 #3593) ar Wong and others (1999 #4073; 2000 #5137) used estimated slip rates of 0.005–0. mm/yr in their analyses of the earthquake hazards associated with the Bolton faul
Date and Compiler(s)	2002 Stephen F. Personius, U.S. Geological Survey
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#4067 Madin, I.P., 1990, Earthquake-hazard geology maps of the Portland metropolitan area, Oregon—Text and map explanation: State of Oregon, Departm of Geology and Mineral Industries Open-File Report 0-90-2, 21 p., 8 pls., scale 1:24,000.

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#3575 Madin, I.P., and Mabey, M.A., 1996, Earthquake hazard maps for Oregon: of Oregon, Department of Geology and Mineral Industries Geological Map Series GMS-100, 1 sheet.

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#4166 Schlicker, H.G., and Finlayson, C.T., 1979, Geology and geologic hazards northwestern Clackamas County, Oregon: State of Oregon, Department of Geolog and Mineral Industries Bulletin 99, 79 p., 10 pls., scale 1:24,000.

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