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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.**

## Concord fault, Concord section (Class A) No. 38b

**Last Review Date: 1998-08-18**

## Compiled in cooperation with the California Geological Survey

***citation for this record:*** **Bryant, W.A., and Cluett, S.E., compilers, 1998, Fault number 38b, Concord fault, Concord section, 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 03:11 PM.**

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| **Synopsis** | **General:** Holocene active dextral strike-slip fault. Fault is characterized by aseismic creep at a rate of 3.0–3.5 mm/yr (Galehouse, 1999 #5500). Several site-specific studies in compliance with the Alquist-Priolo Act have documented the location and approximate time of the most recent faulting (Wills and Hart, 1992 #5340; 1992 #5341). Detailed studies at Galindo Creek yielded a preliminary slip-rate of 3.7±2.0 mm/yr (Borchardt, 1998 #5334).<br><br>**Sections:** This fault has 3 sections. Sharp (1973 #508) defined |

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| | three segments based on differences in geomorphic expression and amount of fault creep. Due to reconnaissance nature of his report, Sharp's segments are herein considered as sections. |
| **Name comments** | **General:** Concord fault was first mapped and named by Poland (1935 #5337) based on groundwater data. Tolman (1931 #5322) previously referred to the Concord fault as the Sulpher Springs Mountain fault. The Concord fault extends from Suisun Bay south to the northwestern slope of Mt. Diablo.<br><br>**Section:** Defined as the Concord segment by Sharp (1973 #508). Extends from Buchanan airport southeast to westward flowing section of Pine Creek at the base of Lime Ridge.<br><br>**Fault ID:** Comments: Refers to number 160 (Concord fault) of Jennings (1994 #2878) and number C3 (Concord fault) of Working Group on Northern California Earthquake Potential (1996 #1216). |
| **County(s) and State(s)** | CONTRA COSTA COUNTY, CALIFORNIA |
| **Physiographic province(s)** | PACIFIC BORDER |
| **Reliability of location** | Good<br>Compiled at 1:24,000 scale.<br><br>*Comments:* Location of fault traces based on digital revisions to Jennings (1994 #2878) using original mapping by Sharp (1973 #508) and Wills and Hart (1992 #5341) at 1:24,000 scale. |
| **Geologic setting** | This dextral strike-slip fault traverses the town of Concord and borders the western side of Lime Ridge. The northern end of the fault probably connects with the Green Valley fault [37] along an approximately 1-km-wide extensional jog north across Suisun Bay. The southern extent of the fault is conjectural. One possibility is that slip is transferred to the Greenville fault [53] across a complex compressional jog characterized by the Mt. Diablo uplift (Unruh and Sawyer, 1995 #5339). Alternatively, slip may be transferred to the northern part of the Calaveras fault [54] across a complex extensional jog (Oppenheimer and Lindh, 1992 #5336; Wills and Hart, 1992 #5340). Maximum dextral offset along the fault is unknown, but may be several kilometers based on geomorphic expression. |

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| **Length (km)** | This section is 4 km of a total fault length of 20 km. |
| **Average strike** | N28°W (for section) versus N28°W (for whole fault) |
| **Sense of movement** | Right lateral<br><br>*Comments:* Sense of displacement defined by dextral fault creep (Sharp, 1973 #508); (Galehouse, 1999 #5500) and dextral offset of Galindo Creek (Wills and Hart, 1992 #5340; 1992 #5341; Borchardt, 1998 #5334). |
| **Dip Direction** | V<br><br>*Comments:* Near surface dips reported in trench exposures of unconsolidated to moderately consolidated alluvial deposits are variable, but generally are consistent with a vertically dipping strike-slip fault. |
| **Paleoseismology studies** | Two detailed studies involving trenching at Galindo Creek were performed on the Concord section (site 38-1). Studies by Snyder and others (1995 #5338) included the excavation of seven trenches both normal and parallel to the Concord fault at Galindo Creek in order to document the late Holocene slip rate. Studies by Borchardt (1998 #5334) continued the slip rate investigation at Galindo Creek by excavating an additional eleven trenches both normal and parallel to the Concord fault in order to better constrain the location, amount, and timing of dextral offset of Galindo Creek. |
| **Geomorphic expression** | Fault is characterized by geomorphic features indicative of Holocene dextral strike-slip displacement including a closed depression (Keller Lake), scarps and linear tonal contrasts on alluvium, and dextral offset of Galindo Creek (Sharp, 1973 #508; Wills and Hart, 1992 #5340; 1992 #5341; Borchardt, 1998 #5334). |
| **Age of faulted surficial deposits** | Fault offsets late Holocene alluvium. Borchardt (1998 #5334) reports that offset channel deposits are 2.6 ka, on the basis of radiocarbon dates on detrital charcoal. These dated deposits are located in the lowermost 2 percent of "offset channel C" of Borchardt (1998 #5334), indicating that the latest displacement is younger than 2.6 ka. |
| **Historic earthquake** | |

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| **Most recent prehistoric deformation** | latest Quaternary (<15 ka)<br><br>*Comments:* Time of most recent paleoevent is not well constrained. Borchardt (1998 #5334) reported that the most recent displacement is younger than 2.6 ka (late Holocene). |
| **Recurrence interval** | |
| **Slip-rate category** | Between 1.0 and 5.0 mm/yr<br><br>*Comments:* Slip rates of 4.3–17.4 mm/yr were reported by Snyder and others (1995 #5338) with a preferred slip rate of 6.4 mm/yr. This rate was based on inferred dextral offset of Galindo Creek at two locations. Subsequent work at Galindo Creek by Borchardt (1998 #5334) reported a slip rate of 1.7–5.7 mm/yr with a preferred slip rate of 3.7 mm/yr. The revised slip rate is a result of a better-constrained measurement of dextral displacement of Galindo Creek (channel C, site 38-1). An inferred dextral deflection of Galindo Creek about 15 m farther east is not due to offset along the Concord fault (Borchardt, 1998 #5334), thus reducing the total dextral offset postulated in Snyder and others (1995 #5338) study. |
| **Date and Compiler(s)** | 1998<br>William A. Bryant, California Geological Survey<br>Sereyna E. Cluett, California Geological Survey |
| **References** | #5334 Borchardt, G., 1998, Holocene slip rate of the Concord fault at Galindo Creek in Concord, California: U.S. Geological Survey National Earthquake Hazards Reduction Program, Annual Summaries, v. 39, USGS Contract No. 1434-HQ-97-GR-03102, (electronic version on line at http://erp-web.er.usgs.gov/).<br><br>#5500 Galehouse, J.S., 1999, Theodolite measurement of creep rates on San Francisco Bay region faults: U.S. Geological Survey, Summaries of National Earthquake Hazards Reduction Program, v. 40, USGS Contract 99-HQ-GR-0084 (electronic version available on line at http://erp-web.er.usgs.gov).<br><br>#2878 Jennings, C.W., 1994, Fault activity map of California and adjacent areas, with locations of recent volcanic eruptions: California Division of Mines and Geology Geologic Data Map 6, 92 p., 2 pls., scale 1:750,000. |

#5336 Oppenheimer, D.H., and Lindh, A.G., 1992, The potential for earthquake rupture of the northern Calaveras fault, *in* Borchardt, G., and others, eds., Proceedings of the second conference on earthquake hazards in the eastern San Francisco Bay area: California Division of Mines and Geology Special Publication 113, p. 233-240.

#4860 Petersen, M.D., Bryant, W.A., Cramer, C.H., Cao, T., Reichle, M.S., Frankel, A.D., Lienkaemper, J.J., McCrory, P.A., and Schwartz, D.P., 1996, Probabilistic seismic hazard assessment for the State of California: California Department of Conservation, Division of Mines and Geology Open-File Report 96-08 (also U.S. Geological Open-File Report 96-706), 33 p.

#5337 Poland, J.F., 1935, Ground-water conditions in Ygnacio Valley, California: Stanford University, M.A. thesis, 83 p.

#508 Sharp, R.V., 1973, Map showing recent tectonic movement on the Concord fault, Contra Costa and Solano Counties, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-505 (U.S. Department of the Interior and U.S. Department of Housing and Urban Development Basic Data Contribution 55), 1 sheet, scale 1:24,000.

#5338 Snyder, D.L., Wills, C.J., and Borchardt, G.A., 1995, Slip rate and earthquake recurrence on the Concord fault at Galindo Creek, California: U.S. Geological Survey, Final Technical Report, National Earthquake Hazards Reduction Program, Contract No. 1434-94-G-2483, 37 p.

#5322 Tolman, C.F., 1931, Geology of upper San Francisco Bay region with special reference to a salt water barrier below confluence of Sacramento and San Joaquin Rivers (Appendix D): California Department of Water Resources Bulletin No. 28, 309-360 p.

#5339 Unruh, J.R., and Sawyer, T.L., 1995, Late Cenozoic growth of the Mt. Diablo fold and thrust belt, central Contra Costa County, California, and implications for transpressional deformation of the northern Diablo Range [abs.]: American Association of Petroleum Geologists, 1995 Pacific Section Convention Abstracts, 47 p.

#5340 Wills, C.J., and Hart, E.W., 1992, Progress in understanding the Concord fault through site specific studies, *in* Borchardt, G., and others, eds., Proceedings of the second conference on earthquake hazards in the eastern San Francisco Bay area: California Division of Mines and Geology Special Publication 113, p. 311-317.

#5341 Wills, C.J., and Hart, E.W., 1992, The Concord fault, Contra Costa County, California: California Division of Mines and Geology Fault Evaluation Report FER-231, 37 p., scale 1:24,000.

#1216 Working Group on Northern California Earthquake Potential (WGNCEP), 1996, Database of potential sources for earthquakes larger than magnitude 6 in northern California: U.S. Geological Survey Open-File Report 96-705, 40 p.