Jump to Navigation

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.

Monterey Bay- Tularcitos fault zone, Monterey Bay section (Class A) No. 62a

Last Review Date: 2001-06-08

citation for this record: **Bryant, W.A., compiler, 2001, Fault number 62a, Monterey Bay- Tularcitos fault zone, Monterey Bay 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 03:03 PM.**

Synopsis	**General:** Monterey Bay-Tularcitos fault zone is a complex, generally northwest-striking zone up to 15 km wide of dextral, dextral-reverse, and thrust faults (Greene and others, 1973 #1323; Dibblee, 1974 #4829; Clark and others, 1974 #6136; Rosenberg, 1993 #6158; Rosenberg and Clark, 1994 #6144). Detailed reconnaissance level mapping is by Greene and others (1973 #1323), Dibblee (1974 #4829), Clark and others (1974 #6136), McCulloch and Greene (1990 #5406), Rosenberg (1993 #6158), Rosenberg and Clark (1994 #6144), and Clark and others (1997 #6137). Rosenberg and Clark (1994 #6144) documented evidence of Holocene displacement along the Hatton Canyon, Sylvan Thrust, and Tularcitos faults. McCulloch and Greene (1990 #5406) mapped Holocene alluvium as offset along offshore traces of the of the Monterey Bay fault zone. Monterey Bay-Tularcitos fault zone lacks detailed studies and evidence of late Pleistocene

	and Holocene slip rates is poorly constrained. Dextral slip rates are not known. Rosenberg and Clark (1994 #6144) reported vertical slip rates that ranged from 0.02 mm/yr for the Navy fault (late Pleistocene vertical rate), to 0.4 mm/yr for the Sylvan Thrust fault (Holocene vertical rate). Post-Middle Miocene dextral slip rate of 0.3-1.5 mm/yr can be inferred for Tularcitos fault zone based on postulated dextral displacement by Graham (1976 #6155). However, timing of total dextral displacement is poorly constrained. **Sections:** This fault has 3 sections.
Name comments	**General:** **Section:** Section name and boundaries proposed in this compilation. Section encompasses the Monterey Bay fault zone, which is delineated by a 10-15 km wide diffuse zone of short en echelon northwest-striking faults. The section extends from near the San Gregorio fault zone [60] about 6 km southwest of Santa Cruz and extends to the southeast across Monterey Bay to the Seaside-Monterey area. It is not clear if the Monterey Bay fault zone dies out before it reaches the San Gregorio fault zone [60] or if the San Gregorio fault zone [60] truncates the Monterey Bay fault zone. **Fault ID:** Refers to numbers 229 (Monterey Bay fault zone), 232 (Navy fault), and 236 (Tularcitos fault) of Jennings (1994 #2878) and number LO4 (Monterey Bay-Tularcitos fault zone) of Working Group on Northern California Earthquake Potential (1996 #1216).
County(s) and State(s)	MONTEREY COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* Locations based on digital revisions to Jennings (1994 #2878) using original mapping by McCulloch and Greene (1990 #5406) at 1:250,000.
Geologic setting	Generally northwest-striking zone of discontinuous faults located in the complexly deformed Salinian block bounded by the San

	Andreas [1] fault zone to the northeast and the San Gregorio [60] fault zone to the southwest. Monterey Bay-Tularcitos fault zone extends for about 84 km from about 6 km southwest of Santa Cruz, near the San Gregorio [60] fault, across Monterey Bay southeast to the Monterey Peninsula to near the crest of the Sierra de Salinas. Cumulative dextral and vertical displacement are not known. Graham (1976 #6155) postulated between 3.2 km and 16 km of dextral strike-slip displacement may have occurred along the Tularcitos fault zone, based on apparent dextral separation of distinctive beds in the Miocene Monterey Formation. Fiedler (1944 #6140) reported 380 m of post-Miocene up-to-north vertical displacement along the Tularcitos fault zone.
Length (km)	This section is 42 km of a total fault length of 84 km.
Average strike	N38°W (for section) versus N44°W (for whole fault)
Sense of movement	Right lateral *Comments:* Earthquake focal mechanisms for Monterey Bay fault zone indicate dextral strike-slip displacement along N50?W strike (McNally and Stakes, 1999 #6157).
Dip Direction	NE; SW *Comments:* Earthquake focal mechanisms indicate Monterey Bay fault zone is characterized by vertical dip with dextral strike-slip displacement along N50?W strike (McNally and Stakes, 1999 #6157). Greene and others (1973 #1323) show steep to vertical dips in cross-sections based on offshore seismic-reflection profiles.
Paleoseismology studies	
Geomorphic expression	Monterey Bay fault zone located entirely offshore. Offshore seismic imaging locally shows strands offsetting sea floor near southern Monterey Bay (Greene and others, 1973 #1323).
Age of faulted surficial deposits	Monterey Bay fault zone offsets Miocene age sedimentary rocks of the Monterey and Purisima formations, unconsolidated sediments of the Plio-Pleistocene Paso Robles Formation, and unconsolidated sediments of Quaternary and, locally, Holocene age (McCulloch and Greene, 1990 #5406).

Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Timing of the most recent paleoevent is poorly constrained. McCulloch and Greene (1990 #5406) show undifferentiated Holocene strata as offset along some strands of the Monterey Bay fault zone.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Slip rate is estimated for entire zone based on summation of reported slip-rates for the Seaside-Monterey and Tularcitos sections. Petersen and others (1996 #4860) estimate a poorly constrained slip rate of 0.5 mm/yr (with minimum and maximum assigned slip rates of 0.1 mm/yr and 0.9 mm/yr, respectively) for probabilistic seismic hazard assessment for the State of California.
Date and Compiler(s)	2001 William A. Bryant, California Geological Survey
References	#6151 Beal, C.H., 1915, The geology of the Monterey quadrangle, California: Stanford, California, Stanford University, unpublished M.S. thesis, 88 p., scale 1;62,500. #6136 Clark, J.C., Dibblee, T.W., Jr., Greene, H.G., and Bowen, O.E., Jr., 1974, Preliminary geologic map of the Monterey and Seaside 7.5-minute quadrangles, Monterey County, California, with emphasis on active faults: U.S. Geological Survey Miscellaneous Field Studies Map MF-577, scale 1:24,000. #6137 Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, Geologic map of the Monterey and Seaside 7.5-minute quadrangles, Monterey County, California—A digital database: U.S. Geological Survey Open-File Report 97-30, map scale, scale 1:24,000. #4829 Dibblee, T.W., Jr., 1974, Geologic maps of the Monterey, Salinas, Gonzales, Point Sur, Jamesburg, Soledad, and Junipero Serra 15-minute quadrangles, Monterey County, California: U.S. Geological Survey Open-File Report 74-5021, 7 sheets, scale

1:62,500.

#6140 Fiedler, W.M., 1944, Geology of the Jamesburg quadrangle, Monterey County, California: California Journal of Mines and Geology, Report XL of the State Mineralogist, v. 40, no. 2, p. 177-250, scale 1:62,500.

#6154 Galliher, E.W., 1930, A study of the Monterey Formation, California, at the type locality: Stanford, California, Stanford University, unpublished M.S. thesis, 29 p., scale 1:62,500.

#6155 Graham, S.A., 1976, Tertiary sedimentary tectonics of the central Salinian block of California: Stanford, California, Stanford University, unpublished Ph.D. dissertation, 510 p., 1 pl.

#6156 Greene, H.G., 1970, Geology of southern Monterey Bay and its relationship to the ground water basin and salt water intrusion: U.S. Geological Survey Open-File Report, 50 p.

#1323 Greene, H.G., Lee, W.H.K., McCulloch, D.S., and Brabb, E.E., 1973, Faults and earthquakes in the Monterey Bay region, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-518 (U.S. Department of the Interior and U.S. Department of Housing and Urban Development Basic Data Contribution 58), 14 p. pamphlet, 4 sheets.

#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.

#5406 McCulloch, D.S., and Greene, H.G., 1990, Geologic map of the central California continental margin, Map No. 5A (Geology), *in* Green, H.G., and Kennedy, M.P., eds., Geology of the central California continental margin: California Division of Mines and Geology California Continental Margin Geologic Map Series, Area 5 of 7, scale 1:250,000.

#6157 McNally, K.C., and Stakes, D.S., 1999, Implications of the San Gregorio fault zone seismicity for Monterey Bay coastal hazard assessment: American Association of Petroleum Geologists Bulletin, v. 83, no. 4, p. 696.

#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. #6158 Rosenberg, L.I., 1993, Earthquake and landslide hazards in the Carmel Valley area, Monterey County, California: San Jose, California, San Jose State University, unpublished M.S. thesis, 123 p., scale 1:24,000. #6144 Rosenberg, L.I., and Clark, J.C., 1994, Quaternary faulting of the greater Monterey area, California: Technical report to U.S. Geological Survey, under Contract 1434-94-G-2443, 27 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.