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, Tularcitos section (Class A) No. 62c

Last Review Date: 2001-06-08

citation for this record: **Bryant, W.A., compiler, 2001, Fault number 62c, Monterey Bay- Tularcitos fault zone, Tularcitos 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, proposed in this compilation, encompasses the Tularcitos fault zone. Tularcitos section extends from the vicinity of Snivleys Ridge were the Tularcitos fault branches into several northwest-trending splays southeast to the Jamesburg area where the Tularcitos fault branches into the Paloma fault. **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	Good Compiled at 1:100,000 scale. *Comments:* Locations based on digital revisions to Jennings (1994 #2878) and Rosenberg (2001 #6159) using original mapping by Fiedler (1944 #6140), Bowen (1969 #6133), and Dibblee (1974 #4829) at 1:62,500; mapping by Clark and others (1974 #6136), Bryant (1985 #6135), and Rosenberg and Clark (1994 #6144) at 1:24,000.
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 32 km of a total fault length of 84 km.
Average strike	N56°W (for section) versus N44°W (for whole fault)
Sense of movement	Right lateral *Comments:* Fiedler (1944 #6140) reported about 380 m of post-Miocene vertical displacement (up-to-north). Graham (1976 #6155) postulated between 3.2 km and 16 km of dextral strike-slip offset may have occurred along the Tularcitos fault, based on an apparent dextral offset of distinctive beds of the Miocene Monterey Formation.
Dip	70° to 85° *Comments:* Dip angles observed in outcrops range from (Bryant, 1985 #6135).
Paleoseismology studies	
Geomorphic expression	Traces of the Tularcitos fault generally are not well-defined and are delineated by geomorphic features such as vague tonal lineaments, aligned benches and saddles. A significant portion of the northern Tularcitos section is located along the Carmel River valley and drainages that cross traces of the Tularcitos fault are not offset in a dextral or vertical sense (Bryant, 1985 #6135; Rosenberg, 1993 #6158).
Age of faulted surficial deposits	Fault offsets Mesozoic (Cretaceous?) crystalline basement rocks, Tertiary sedimentary rocks, late Pleistocene alluvium, and early Holocene colluvial deposits (Dibblee, 1974 #4829; Clark and others, 1974 #6136; Rosenberg and Clark, 1994 #6144).

Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Timing of most recent paleoevent is not well-constrained. Rosenberg and Clark (1994 #6144) mapped offset Pleistocene terrace deposits and 7.78 ka (conventional 14C age) colluvium.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Weber (1984 #6160) inferred a post-Miocene vertical slip-rate of 0.08-0.2 mm/yr, based on postulated post-Miocene 1200 m vertical displacement. Rosenberg and Clark (1994 #6144) calculated a late Pleistocene to Holocene vertical slip-rate of 0.13 mm/yr, based on a 1 m vertical displacement of 7.78 ka (conventional 14C age) colluvium. Late Quaternary dextral component of slip is not known. Graham (1976 #6155) postulated between 3.2 km and 16 km of post Middle Miocene dextral offset. This infers a long term dextral slip-rate between 0.3 mm/yr and 1.5 mm/yr for the Tularcitos fault. However, timing of total dextral displacement is poorly constrained. Poorly constrained slip rate assigned to the entire fault by Petersen and others (1996 #4860) for probabilistic seismic hazard assessment for the State of California was 0.5 mm/yr (with minimum and maximum assigned slip rates of 0.1 mm/yr and 0.9 mm/yr, respectively.
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. #6133 Bowen, O.E., Jr., 1969, Geologic map of the Monterey quadrangle: California Division of Mines and Geology open-file map, scale 1:62,500. #6135 Bryant, W.A., 1985, Faults in the southern Monterey Bay area, Monterey County, California: California Division of Mines and Geology Fault Evaluation Report 167 (microfiche copy in California Division of Mines and Geology Open-File Report 90-

11).

#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.

#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.

#6159 Rosenberg, L.I., 2001, Geologic resources and constraints, Monterey County California—A technical report for the Monterey County 21st Century general plan update program: Monterey County Environmental Resource Policy Department Open-File Report, 167 p., 10 sheets, 1 CD-ROM with ArcView shape files.

#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.

#6160 Weber, G.E., 1984, New San Clemente Dam, Geotechnical investigation of faulting in the "Knothole" area: Santa Cruz, California, Rogers E. Johnson and Associates, consulting report for Monterey Peninsula Water Management district, 17 p., 1 pl.

#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.